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ENGLISH, EDUCATION, AND THE ELECTRONIC REVOLUTION.

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DESCRIPTORS- *COMPUTERS, *CYBERNETICS, *ENGLISH INSTRUCTION, *MASS MEDIA, *TEACHER EDUCATION, COMPUTER ASSISTED INSTRUCTION, COMPUTER BASED LABORATORIES, COMPUTER ORIENTED PROGRAMS, ELEMENTARY EDUCATION, ENGLISH EDUCATION, HIGHER EDUCATION, INFORMATION RETRIEVAL, INFORMATION STORAGE, INSTRUCTIONAL FILMS, PHONOGRAPH RECORDS, SECONDARY EDUCATION, TAPE RECORDINGS, TELEVISED INSTRUCTION, VIDEO TAPE RECORDINGS,

ALTHOUGH MANY OF THE RECENT DEVELOPMENTS IN CONTEMPORARY CULTURE HAVE RECEIVED CONSIDERABLE ATTENTION BY TEACHERS OF ENGLISH, THE INCREASING IMPORTANCE OF CYBERNETICS AND THE USE AND USEFULNESS OF MASS MEDIA HAVE BEEN LARGELY IGNORED. THIS MONOGRAPH BEGINS WITH A CHAPTER ON THE HISTORICAL DEVELOPMENT OF THE COMPUTER AND MASS MEDIA AND THEIR IMPACT IN THE NEAR FUTURE ON EVERY ASPECT OF HUMAN LIFE. CHAPTER 2 EXPLAINS THE OPERATION, CAPABILITIES, AND APPLICATIONS OF THE COMPUTER. CHAPTER 3 TREATS THE EDUCATIONAL APPLICATIONS OF THE COMPUTER AND ITS EXTENSIONS IN MASS MEDIA, ILLUSTRATING ITS PRESENT GERMINAL USE AS A TEACHING MACHINE AND THE BASIS FOR INFORMATION RETRIEVAL SYSTEMS AND SHOWING HOW IT WILL INEVITABLY BECOME INSTRUMENTAL TO THE ENTIRE EDUCATIONAL PROCESS. DANGERS ARE INHERENT IN SUCH A SYSTEM, HOWEVER, AND CHAPTER 4 DESCRIBES THE MOST SIGNIFICANT ONES IN LIGHT OF THE HUMANISTIC AIMS OF A LIBERAL EDUCATION AND, PARTICULARLY, OF ENGLISH AS A SUBJECT AREA. FINALLY, CHAPTER 5 TURNS TO THE IMPACT OF CYBERNETICS AND MASS MEDIA ON THE TEACHING OF ENGLISH. TELEVISION, THE MOTION PICTURE, RADIO, RECORDINGS AND TAPES, AND THE COMPUTER ARE TREATED SEPARATELY IN THIS LAST CHAPTER, THUS EMPHASIZING THE NECESSITY FOR TRAINING PRESENT AND FUTURE TEACHERS IN THE USE--AND WARNING THEM OF THE MISUSE--OF THESE MACHINES. THIS DOCUMENT IS AVAILABLE FROM THE NATIONAL COUNCIL OF TEACHERS OF ENGLISH, 508 SO. 6TH ST., CHAMPAIGN, ILL., ORDER NO. 18108, $1.50. (DL)

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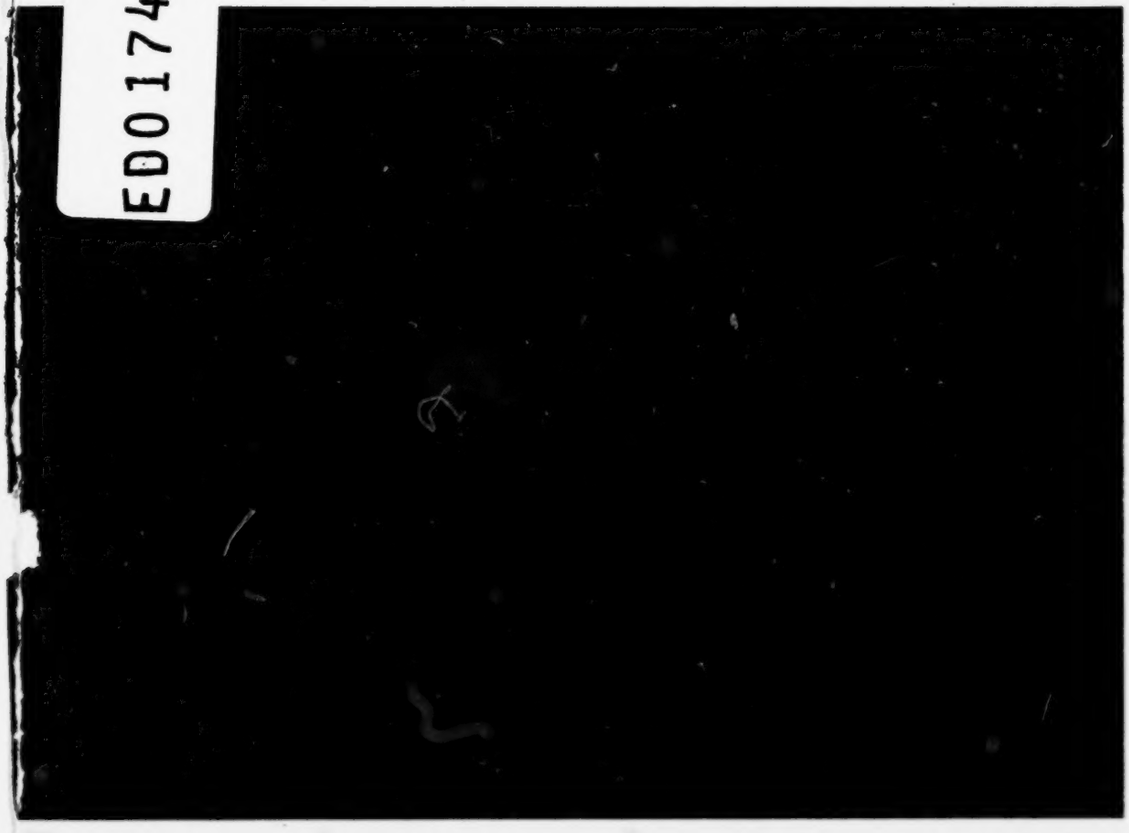

NATIONAL COUNCIL OF TEACHERS OF ENGLISH
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ENGLISH, EDUCATION, AND THE ELECTRONIC REVOLUTION

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U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
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Foreword

As one who supervises student teachers preparing to become secondary teachers of English, I have daily opportunity to sit in the back of classrooms and observe. During the past seven years, I have sat in over 200 different classrooms and have watched increasing numbers of students become bored with lessons which they have considered to be inane, unprofitable—in its multiple sense—and/or too slow-paced. The unrest I witness differs manifestly from the clock-watching ennui I suffered as a high school student. For one thing, students frequently verbalize their dissatisfaction to the teacher, something my generation did not do. Too, their protests about what they consider to be superficial content frequently reveal an awareness of and an involvement with the issues of their times—Civil Rights, Vietnam, nonconformity—which my generation lacked. Partially, then, the following paper is a consequence of my curiosity about the ways in which electronic media are helping create students different from those in the pretelevision, pretransistor days, students who are demanding an education different in at least style and pace from that of a generation ago.

The more I read about media and its effects upon students, the more aware I become of how teachers will be affected by the accelerating involvement in education of electronics industries. I would now argue that those of us in English education are not preparing beginning teachers for what lies ahead, that our first course in a sequence in teacher preparation should

be a course in media, one which would go well beyond the oft-criticized audiovisual requirement. The course I envision would train the teacher not only to thread a projector, run a ditto, and play a tape recorder; it would, among other things, provide a history of media, teach the film as an art, and require one to program a computer. My paper is, then, also partially a consequence of my concern about how best to prepare beginning teachers of English for the future.

Finally, the more I read about the computer, the more disturbed I become that few humanists are concerning themselves with its potential effects upon individuals and upon the society. Computers are programed, programs develop from conscious choices, and choices imply value systems which influence one's selection of items—*this*, rather than *that*. Though traditionally concerned with values, humanists once again seem to be ignoring the capability of technology to impose value systems often at variance with those traditionally revered. If we are eventually to have computerized classrooms, I would like some assurance that students will emerge from their instruction not as mere knowledgeable extensions of machines but as more sensitive, hopefully more moral, human beings. Partially, then, the paper is an attempt to alert humanists to the revolution now occurring and to encourage their participation in guiding its direction.

The tone of my manuscript is equivocal. I am as afraid of the future as is the next man, yet must choose to be optimistic. In a world armed for Armageddon, with pollution in air and water, with a world population that in the century and a half from 1850 to 2000 will have risen from one billion to seven billion, I find no other choice.

EDMUND J. FARRELL

Introduction

During the next decade, technological developments already affecting many school programs must be seriously considered by the profession. Simple machines and electronic devices are already introduced in many conventional classes. Extensive experimental teaching now underway in centers throughout the country promises important new aids to learning. Teachers of English concerned with the processes of communication can no longer easily ignore the impact of this new technology on the transmission of ideas in our culture. In this arresting monograph, Edmund J. Farrell alerts us to the dangers and possibilities of the new electronic developments and especially to their potential influence on the teaching and learning of English.

Initially discussed at an NDEA Institute for Advanced Study in English (University of Illinois), the monograph was revised and extended as a result of comments by eight teachers and supervisors: Peter LaForge, Niles North High School, Skokie, Illinois; Bruce Roberts, Lake Park High School, Medinah, Illinois; Douglas Campbell, Santa Rosa High School, California; Sister M. Fanchon, C.S.J., Newton Centre, Massachusetts; Robert Weinberger, Grover Cleveland High School, Brooklyn, New York; John C. Eckman, Oak Lawn Community High School, Illinois; Anne Dunn, Granger High School, Washington; and Nelda Kubat, Lansing High School, Ludlowville, New York.

The profession is grateful to these readers and to Mr. Farrell for the stimulating discussion of critical developments in contemporary culture which for too long have not attracted the thoughtful attention of teachers of English.

JAMES R. SQUIRE
National Council of Teachers of English

Contents

FOREWORD iii
Edmund J. Farrell

INTRODUCTION v
James R. Squire

I. THE REVOLUTION—A QUICK OVERVIEW 1

II. THE COMPUTER—HEART OF THE REVOLUTION 13

III. THE COMPUTER AND OTHER MEDIA IN EDUCATION 19

IV. GLIMMERINGS OF UTOPIA 39

V. IMPLICATIONS FOR THE TEACHING OF ENGLISH 50
Television 51
The Motion Picture 58
Radio 61
Recordings and Tapes 62
The Computer 65

VI. BIBLIOGRAPHY 70

I. The Revolution — A Quick Overview

The usually staid public voice of the United Chapters of Phi Beta Kappa, *The American Scholar*, featured in its issue of Spring 1966 articles on what its cover proclaimed as "The Electronic Revolution," thereby alerting the few intellectuals so obtuse as not to know that society is being electronically transformed that it was time they made the scene. Those already alert should not have been surprised to find Marshall McLuhan's name prominently listed first among contributors, for the name of McLuhan has recently become almost as ubiquitous as the media of the electronic age, the age whose oracle, according to *Life* magazine, he has become.[1] Within the past six months, articles by and about, or extensive references to, McLuhan have appeared in such diverse publications as *Harper's Magazine*, *Time*, *Newsweek*, *Life*, *The American Scholar*, *Vogue*, *Esquire*, *Saturday Review*, and *Ramparts*—this last periodical featuring an article for slow learners by Howard Gossage, "Understanding Marshall McLuhan."

McLuhan's popularity, which seems to have taken over among intellectuals (both pseudo and real) the mystique once reserved for J. D. Salinger, can probably be accounted for by the understandable desire among the articulate to have some-

[1] Jane Howard, "Oracle of the Electric Age," *Life*, February 25, 1966, pp. 91-22.

one articulate what's going on. Whether McLuhan's theses are correct—that every medium is an extension of man, that the medium is the message, that the content of every new medium is a preceding medium, etc.—is moot, as can be evidenced by his detractors, among them Dwight McDonald, the *New Yorker* and *Esquire* hatchetman *sine qua non.* The point is that even if McLuhan never existed, the electronic revolution would. McLuhan appeals because at his best he seems to make sense, to paraphrase Pope, of what oft was felt but ne'er before expressed. By providing an historical perspective of media, from clothes to cars to cybernetics, McLuhan helps make understandable the dynamics of change. If he is correct in asserting that the primary purpose of almost every medium is to hasten the transportation of goods and information, then it follows that electronic media are indeed revolutionizing the world: for information transmittal has become instantaneous, automation has accelerated production of goods, and the city as center of communication and production is no longer necessary.

An abiding problem for the individual living in a society undergoing rapid change is that the process of change remains invisible until it has dramatically altered the environment, whereupon one becomes conscious of what used to be. As R. Buckminster Fuller, inventor of the geodesic dome and compeer of McLuhan, observed in his keynote address at Vision 65, a conference for far-out thinkers held last year at Southern Illinois University,

> ...I think it is safe to say that 99 percent of all the important work now being done by men—relating to our evolutionary advance—is work going on in the areas above and below the tunable range of man's direct optical or other sensorial participation in the electromagnetic spectrum. Society neither hears nor sees the great changes going on.[2]

McLuhan makes essentially the same point via Gossage in *Ramparts:* one's environment becomes visible only when it has

---

[2] R. Buckminster Fuller, "Keynote Address, Vision 65," (Carbondale, Illinois: Southern Illinois University Press, October 1965), p. 1.

been replaced by a new environment; for example, the nostalgic romantic movement in literature began only after the industrial revolution had become well established. Much contemporary ferment about educational reforms—the need for flexible scheduling, programed instruction, team teaching, tutorials, preceptorials, interdisciplinary studies—probably derives in large part from critics' unconscious awareness that education as we have known it during the past sixty years was strongly patterned after the industrial production line: a school was a "plant," students were "products," an education was what one completed after so many hours in so many courses over so many years. In short, the old environment of education has become visible largely because that environment has been or is being replaced by a new electronic environment.

Waxing eloquent on what it means to enter an electronic age, McLuhan informed conferees of Vision 65:

> We have, in the Electric Age, come suddenly to the end of the Neolithic Age. After a good many thousands of years of specialized habits and technology and fragmentary toolmaking, we discovered the electric circuits. It is the circuit that has ended the Neolithic age, just like its ultimate phase, the factory age in the nineteenth century, was dedicated to specialism, fragmentation, and extensions of this or that limb of man. With circuitry we have, instead of extensions of hand, or foot, or back, or arm, a kind of involvement of the whole nervous system, an extension of the nervous system itself, a most profoundly involving operation.[3]

Though not all observers of the contemporary scene so enthusiastically welcome the electric age, all seem to recognize that it is having and will continue to have profound effects on our entire way of life—our education, work, leisure time, and political, social, and aesthetic values.

Soberly reflecting upon the potential ability of cybernation to reconstruct society, Donald N. Michael writes:

> Using these machines does not merely involve replacing men by having machines do tasks that men did before. It is, as John Diebold

---

[3] Marshall H. McLuhan, "Address at Vision 65," *The American Scholar*, XXXV (Spring 1966), 201.

> ... a way of "thinking as much as it is a way of doing. ... It is no longer necessary to think in terms of individual machines or even in terms of groups of machines; instead, for the first time, it is practical to look at an entire production or information-handling process as an integrated system and not as a series of individual steps.' For example, if the building trades were to be automated, it would not mean inventing machines to do the various tasks now done by men; rather, buildings would be designed so that they could be built by machines. One might invent an automatic bricklayer, but it is more likely that housing would be designed so that bricks would not be laid. . . .[4]

Because machines will be employed to do that which they do best, they may have undesirable effects even upon how we attempt to solve problems. George Kistiakowsky, the Harvard scholar who heads the Academic Committee on Science and Public Policy, is quoted in *EDUCOM* as expressing fear that "an ever expanding use of computers for the solution of scientific problems might change the nature of problems that active scientists choose for study, and thus change the whole nature of scientific research."[5]

Certainly the electronic revolution and its concomitant, automation, has begun to affect seriously our notions about what constitutes work and what relationship ought to exist between work and income. Believing obsolete an economic system based upon a meaningful equation between man hours, production, and consumption, the authors of "Triple Revolution: Cybernation, Weaponry, Human Rights," among them a number of well-known economists, frankly recommend that we guarantee every individual a livable income:

> As a first step to a new consensus it is essential to recognize that the traditional link between jobs and incomes is being broken. The economy of abundance can sustain all citizens in comfort and economic security whether or not they engage in what is commonly reckoned as work. Wealth produced by machines rather than by men is still wealth. We urge, therefore, that society, through its

[4] Donald N. Michael, *Cybernation: The Silent Conquest* (Santa Barbara: Report to the Center for the Study of Democratic Institutions, 1962), p. 5.

[5] "Digital Computer Needs in Universities and Colleges," *EDUCOM*, I (March 1966), 2.

> appropriate legal and governmental institutions, undertake an unqualified commitment to provide every individual and every family with an adequate income as a matter of right.[6]

In its cover story on "The Cybernated Generation," the editors of *Time* comment:

> Men such as IBM Economist Joseph Froomkin feel that automation will eventually bring about a 20-hour work week, perhaps within a century, thus creating a mass leisure class. Some of the more radical prophets foresee the time when as little as 2% of the work force will be employed, warn that the whole concept of people as producers of goods and services will become obsolete as automation advances. Even the most moderate estimates of automation's progress show that millions of people will have to adjust to leisurely, "nonfunctional" lives, a switch that will entail both an economic wrench and a severe test of the deeply ingrained ethic that work is the good and necessary calling of man.[7]

To understand even partially how electronic media are transforming education, one must remain steadfastly alert to the significance of stories buried in the daily newspapers, to educational articles in periodicals, to the advertisements of electronic companies:

> At the Oakleaf Elementary school in Pittsburgh, some youngsters learn to use earphones before they can hold a pencil properly. Their school has none of the traditional classes or textbooks. They teach themselves with tape recorders, film and special work sheets. . . .
>
> In Los Angeles, computer programs are being developed to help youngsters make more intelligent career choices.
>
> Blind children may learn faster by listening to lessons in "compressed speech," which greatly speeds up the normal wordage rate.
>
> These are some of the fruits of the new research boom in the nation's schools sponsored by the United States Office of Education. . . . These new centers will bring together classroom teachers, scholars from universities and experts from industry to find better ways to teach.[8]

---

[6] Ad Hoc Committee, "Triple Revolution: Cybernation, Weaponry, Human Rights," *Liberation*, April 1964, p. 5, reprint.

[7] "Technology: The Cybernated Generation," *Time*, April 2, 1965, p. 87.

[8] "Research Boom in the Schools," *San Francisco Chronicle*, March 14, 1966.

> To beat the logistics problems and find out how effective film can be when teachers integrate it naturally into their instruction, E.B.F. and Bell & Howell Co. have sent $650,600 worth of films and new, automatic-threading sound projectors to schools in wealthy Shaker Heights, Ohio, a slum area of Washington, D.C., suburban Daly City, Calif., and rural Terrell, Texas. Researchers from Ohio State University are evaluating the three-to-four-year experiment under a grant from the U.S. Office of Education. Although the researchers' verdicts are months away, teachers and students already consider Project Discovery a smash success.[9]
>
> On top of all his parents had to learn, today's 5-year-old will be bombarded with the staggering amounts of new knowledge continually accumulating.
>
> The Knowledge Explosion is a very real problem for our new generation of students. And to help them cope with it, we must speed the learning process.
>
> Already, Sylvania is working with educators to project completely integrated systems of educational communications. Developing more sophisticated applications. Information "banks" that incorporate libraries on tape, capable of being comprehended at many times the speed of normal speech. Video-taped lecture retrieval. Testing machines that can gauge instantly how a class responds to new information.
>
> Such developments are clearly presaged by our systems at work today. Classroom T.V. Audio-video lecture transmission over phone lines. Mobile T.V. broadcast and recording studios. Each system custom-designed by Sylvania to meet a particular problem.
>
> Can schools keep students ahead of the Knowledge Explosion? Yes. And Electronic Systems for Education from Sylvania will help. Sylvania Commercial Electronics, Bedford, Massachusetts.[10]

One characteristic of the electronic age, McLuhan repeatedly insists, is that it deeply involves the individual in ways in which print cannot. When McLuhan asserts that young people today want roles rather than jobs, he is juxtaposing an electronic world which he finds organized integrally and a technological world he finds fragmented and specialized. He is extremely critical of education's failure to accommodate itself quickly to the electronic age in which children are reared:

---

[9] "Education: Public Schools," *Time*, April 1, 1966, p. 94.

[10] "Target of the Knowledge Explosion," *Time* (advertisement), April 1, 1966, p. 35.

> . . . We haven't really cottoned on to the fact that our children work furiously, processing data in an electrically structured information world; and when these children enter a classroom—elementary school—they encounter a situation that is very bewildering to them. The youngster today, stepping out of his nursery or TV environment, goes to school and enters a world where the information is scarce but is ordered and structured by fragmented, classified patterns, subjects, schedules. He is utterly bewildered because he comes out of this intricate and complex integral world of electric information and goes into this nineteenth-century world of classified information that still characterizes the educational establishment. The educational establishment is a nineteenth-century world of classified data much like any factory set up with its inventories and assembly lines. The young today are baffled because of this extraordinary gap between these two worlds."[11]

> . . . Today in our cities, most learning occurs outside the classroom. The sheer quantity of information conveyed by press-magazines-film-TV-radio far exceeds the quantity of information conveyed by school instruction and texts. This challenge has destroyed the monopoly of the book as a teaching aid and cracked the very walls of the classroom so suddenly that we're confused, baffled.[12]

McLuhan can muster considerable support for his belief that the school as an institution is not yet preparing individuals for this age. Lynn White, Jr., professor of history U.C.L.A. and a former president of Mills College, contends that ". . . The new world in which we live is so unlike the past, even the past that is close to us, that in proportion as we are saturated in the Western cultural tradition we are incapacitated for looking clearly at our actual situation and thinking constructively about it. The better we are educated, the more we are fitted to live in a world that no longer exists."[13]

What future place books will have, either in education or leisure time activities, cannot confidently be predicted. Certainly they will not dominate education as they presently do. McLuhan believes that backward countries now have an ad-

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[11] McLuhan, *op. cit.*, p. 198.

[12] Edmund Carpenter and Marshall McLuhan, *Explorations in Communication* (Boston: Beacon Press, 1960), p. 1.

[13] Lynn White, Jr., "On Intellectual Gloom," *The American Scholar, op. cit.*, p. 224.

vantage over us in not being unduly wedded to print:

> Today America has the largest backlog of obsolete technology in the world: its educational and industrial establishments, built by print and methods derived from print, are vast and pervasive. Backward countries have a huge advantage over us: they now stand in relation to electronic technology much as we once stood in relation to print technology. . . .
>
> The relevant factor in this obsolescence is the use of electronic tapes by which information is fed from several points simultaneously and in concert; previously, with print, there has been one unit followed by another unit. With this switch from linear to cluster configuration, literacy lost its main prop in the social structure of our time, because the motivating force in the teaching of reading, and the development of a highly literate culture, was the strict relevance of that classroom discipline to every pattern and purpose in the outside world. Today the outside world is abandoning that very form and providing increasingly less motivation for the teaching of reading and the achieving of literate culture in our schools.[14]

In an essay on the culture differences between oral and written traditions David Riesman observes that ". . . the natives themselves are on the move, and the sharp differences between societies dependent on the oral tradition and those dependent on print are tending to be less important with the coming of radio and film," an observation to which McLuhan would strongly nod assent.[15]

Herbert A. Simon, Carnegie Institute of Technology, optimistically believes that less reliance upon specialized book knowledge will facilitate the growth of common discourse among men:

> The specialization of the disciplines that has developed since Gutenberg is a regrettable consequence of the population explosion among words. Forbidding structures of esoteric knowledge have threatened to restrict the domain of common discourse to a narrow range of "private" matters. Perhaps the most exciting prospect of change resulting from our new technology of information processing is the likelihood that it will halt and reverse this progressive isola-

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[14] Carpenter and McLuhan, *op. cit.*, p. ix.

[15] David Riesman, "The Oral and Written Traditions," *Explorations in Communication*, *ibid.*, p. 115.

> tion of idea from idea and man from man. Mankind, in its professional as well as its nonprofessional aspects, will again become the proper study of man.[16]

In an age when millions of individuals view the same programs, it is not surprising that people in the media believe the spread of television to be contributing to the formation of a collective unconscious potentially global with the increase of satellite relays. Nor should it be surprising that Americans today consider television more believable than newspaper and rely upon it as their primary source of news. About the polls on viewing habits, Burns W. Roper, of Elmo Roper and Associates, commented in a speech delivered at a public relations seminar of the American Bankers' Association:

> There is little I can add to what has been said and written over the last two decades about the increasing dominance of television viewing as a leisure time activity. People do look at a lot of television; it has an impact on their attitudes and activities; what that impact is, how much of it is good, how much of it bad, has not yet been definitely established. What these figures do show is that there is increasing reliance on television, particularly among those who have grown up with it, and that it is seen not merely as an entertainment medium but as a vehicle for serious news dissemination as well.[17]

For the issue of *The American Scholar* devoted to the electronic revolution, Stan Van Der Beek, experimental film maker, wrote a lengthy free-form poem, part of which is a paean to new media:

> I have emphasized that motion pictures are the unique
> art form
> of the 20th century,
> that they have produced a revolution in worldwide aesthetics,
> (namely, that motion pictures have produced the new
> aesthetics of
> anticipation, as compared to the older idea of painting
> and art

---

[16] Herbert A. Simon, "A Computer for Everyman," *The American Scholar, op. cit.*, p. 264.

[17] Burns W. Roper, "The Growing Importance of Television News and the Medium's Emerging Role in Corporate Public Relations," p. 4.

> history as "meditation") . . .
> that cinema is just beginning to come into its own . . .
>
> The future holds unknown combinations of some of the present
> loosely knit ideas . . .
> integration of cinema, theater, dance, drama, electronic sound and
> sights, movie-dromes, video tape, libraries of film kinetic and
> "expanded" cinema, "movie-murals," movie-mosaics" . . .[18]

Universities are also being rapidly transformed by electronic media, placing less reliance than was once true upon "book knowledge," an assertion that will be more thoroughly documented later in this paper. Ralph W. Gerard, University of California at Irvine, is quoted as having said at a 29 December symposium he arranged on "Computers and Universities,"

> Since universities are systems that are intimately concerned with handling information, and computers are the same, it seems inevitable that there should be some kind of explosive interaction between them if nature is given a chance.

He then predicted that "institutions of higher learning will be altered as vastly by the new information sciences as they were five centuries ago 'by the advent of an earlier technology, which is known as printing'."[19]

In summary, we are in the midst of a revolution which is radically changing the entire society, its production and consumption of goods, its leisure time activities, its institutions—among them education—and its values. The revolution is characterized by rapidity—which precludes any definitive assessment of the effects.

> . . . We haven't lived for some time in a period that has produced much Utopian literature probably because no Utopian literature

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[18] Stan Van Der Beek, "Re: Vision," *The American Scholar, op. cit.*, p. 338.

[19] "Direct Dialing to Digital Computers," *EDUCOM*, January 1966, p. 8.

> has really been able to catch up with and envisage the conditions of contemporary life; things have moved too fast.[20]
>
> The complex, sophisticated field of self-instructional devices or teaching machines has grown so rapidly in the last five years that any survey of current materials is obsolete prior to its publication. As of September, 1962, there were 122 commercial programs, although an earlier estimate of 630 programs included many in planning stages.[21]
>
> . . . Books on the concept of concurrently-usable computers are not yet common. A publisher recently observed, "if I asked an author today to write one, it would be out of date by the time we could get it in print."[22]
>
> The institutions of the world find themselves in the midst of a management crisis primarily because the world has changed drastically and swiftly, while their management processes have not allowed them to adapt to these changes. Technology has totally outstripped technique.[23]

Whether one believes the electronic revolution will have deleterious or beneficial consequences for mankind, he can not ignore it. Even those most concerned with its potentially destructive effects upon human values readily admit that the process is irreversible: one cannot halt cybernation; one may only hopefully contribute to its intelligent control. What ultimate—if one can use such a word—effects the revolution will have waits to be known:

> . . . Cybernation presages changes in the social system so vast and so different from those with which we have traditionally wrestled that it will challenge to their roots our current perceptions about the viability of our way of life. If our democratic system has a chance to survive at all, we shall need far more understanding of the consequences of cybernation. Even the job of simply preserving a *going*

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[20] *Cacotopias and Utopias: A Conversation* (Santa Barbara, Calif.: Center for the Study of Democratic Institutions, 1965), p. 19.

[21] Stanley Soles, "Educational Quackery External to Our Schools: What Is a Professional Response?" *Programs, Teachers, and Machines*, ed. A. de Grazia and D. Sohn (New York: Bantam Books, 1962), p. 274.

[22] "Direct Dialing to Digital Computers," *op. cit.*, p. 7.

[23] David B. Hertz, "Computers and the World Communications Crisis," *The American Scholar, op. cit.*, p. 266.

society will take a level of planning far exceeding any of our previous experiences with centralized control.[24]

"When these new machines realize their potential," says John Diebold, chairman of the Diebold Group, Inc., consultants in the computer field, "there will be a social effect of unbelievable proportions. This impact on society is still to come.[25]

[24] Michael, *op. cit.*, p. 13.
[25] "Technology: The Cybernated Generation," *op. cit.*, p. 85.

II. The Computer— Heart of the Revolution

Few technological developments are formidable enough to mark turning points in human history. Two such phenomena have occurred in our time: the atomic bomb and the computer.

The implications of the bomb are beginning to be understood—its capacity for instant and total destruction has been demonstrated. The implications of the computer as yet are only faintly comprehended. That they will be awesome is already apparent. Indeed, as Dr. Jerome B. Wiesner, Dean of Science at the Massachusetts Institute of Technology and former science adviser to President Kennedy, wrote recently in *The New York Times:*

"The computer, with its promise of a million-fold increase in man's capacity to handle information, will undoubtedly have the most far-reaching social consequences of any contemporary technical development. The potential for good in the computer, and the danger inherent in its misuse, exceed our ability to imagine. . . . We have actually entered a new era of evolutionary history, one in which rapid change is a dominant consequence. Our only hope is to understand the forces at work and to take advantage of the knowledge we find to guide the evolutionary process."[1]

Although the electronic revolution is occurring because a complex of media—radio, film, television, tape recorder, phonograph and record among them—have become integral to our lives, the rate of the revolution seems proportional to the production of computers. The editors of *Time* write:

[1] "The New Computerized Age," *Saturday Review*, July 23, 1966, pp. 15-16.

> Just out of its teens, the computer is beginning to affect the very fabric of society, kindling both wonder and widespread apprehension. Is the computer a friend or enemy of man? Will it cause hopeless unemployment by speeding automation, that disquieting term that it has brought into the language? Will it devalue the human brain, or happily free it from drudgery? Will it ever learn to think for itself? The answers will not be in for quite a while, but one thing is already clear: swept forward by a great wave of technology, of which the computer is the ultimate expression, human society is surely headed for some deep-reaching changes.[2]

The frenetic tone is understandable, for as the same article points out, the computer has already been called upon to perform more than 700 specific tasks,

> . . . from bookkeeping to monitoring underground nuclear explosions. Computers control the flow of electric current for much of the nation, route long-distance telephone calls, set newspaper type, even dictate how sausage is made. They navigate ships and planes, mix cakes and cement, prepare weather forecasts, check income tax returns, direct city traffic and diagnose human—and machine—ailments. They render unto Caesar by sending out the monthly bills and reading the squiggly hieroglyphics on bank checks, and unto God by counting the ballots of the world's Catholic bishops at sessions of the Ecumenical Council in St. Peter's Basilica.[3]

One computer, VIDIAC, is potentially capable of writing 50,000 words per second.[4] Some sophisticated computers can multiply 500,000 10-digit numbers in 1 second.[5] The Illinois Pattern Recognition Computer, ILLIAC III, an experimental computer built at the University of Illinois, can "read and differentiate among separate parts of photographs, graphs, maps, slides, and such, performing up to 1,024 logical operations at once. It could, for instance, detect certain diseased cells on a slide."[6] Through time sharing, in which numerous users have

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[2] "Technology: The Cybernated Generation," *Time*, April 2, 1965, p. 84.
[3] *Ibid.*
[4] D. S. Halacy, *Computers: The Machines We Think With* (New York: Dell Publishing Co., Inc., 1964), p. 219.
[5] "Technology: The Cybernated Generation," *op. cit.*, p. 86.
[6] Robert D. Tschirgi, "Loving a 'Computer-Tutor'," *EDUCOM*, February 1966, p. 10.

almost simultaneous access to its use, Project MAC (for Machine-Aided Cognition) at M.I.T.

> . . . is already solving problems, answering questions and keeping books on an experimental basis for some 400 users. Scientists who know MAC's language can feed their problems to the computer from typewriter-like keyboards in their own homes or labs. Thus, computers will eventually become as close to everyday life as the telephone—a sort of public utility of information.[7]

Machine Translations Inc. has announced ". . . a new technique making possible contextual translation at the rate of 60,000 words an hour."[8] At the University of Connecticut a computer programed to evaluate students' written compositions has achieved as high a reliability as that achieved by a competent reader.[9] In the Librascope Laboratory for Automata Research, a computer produced this "beat" poem:

> Sob suddenly, the bongos are moving
> Or could we find that tall child?
> And dividing honestly was like praying badly,
> And while the boy is obese, all blast could climb.
> First you become oblong,
> To weep is unctious, to move is poor.[10]

Recently the computer became an advertising inducement to do business with Wells Fargo. *Cal Daily* (April 13, 1966) printed an ad headed in large boldface type, "Our talking computer has figured out a way to save you time." This invitation followed:

> Just come in to any office of Wells Fargo in Berkeley or San Francisco. And ask one of our nice real-life tellers to introduce you to our talking computer. For openers, you might ask it what the balance is in your checking account. Within seconds it gives the

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[7] "Technology: The Cybernated Generation," *op. cit.*, p. 91.

[8] Halacy, *op. cit.*, p. 216.

[9] Arthur Daigon, "Computer Grading of English Composition," *English Journal*, LV (January 1966), 46-53; and Ellis B. Page, "The Imminence of . . . Grading Essays by Computer," *Phi Delta Kappan*, XLVII (January 1966), 238-243.

[10] Halacy, *op. cit.*, p. 134.

> answer. In its own electronic voice. Saves you time when you want to cash checks. And you can cash checks now at any office in Berkeley or San Francisco—with only 30 seconds required for check verification. Come in soon for a demonstration.

Such uses for the computer may appear frivolous to the reader. One should not, however, take lightly the serious tasks of the computer:

> . . . computers are being used rather regularly to analyze market portfolios for brokers; compute the best combination of crops and livestock for given farm conditions; design and "fly" under typical and extreme conditions rockets and airplanes before they are built; design, in terms of cost and traffic-flow characteristics, the appropriate angles and grades for complex traffic interchanges; keep up-to-date inventory records and print new stock orders, as automatically computed rates of sales and inventory status indicate. Computers have also been programmed to write mediocre TV dramas (by manipulating segments of the plot), write music, translate tolerably if not perfectly from one language to another, and simulate some logical brain processes (so that the machine goes about solving puzzles—and making mistakes in the process—in the ways people do). Also, computers are programmed to play elaborate "games" by themselves or in collaboration with human beings. Among other reasons, these games are played to understand and plan more efficiently for the conduct of wars and the procedures for industrial and business aggrandizement. Through such games, involving a vast number of variables, and contingencies within which these variables act and interact, the best or most likely solutions to complex problems are obtained.[11]

Moreover, because of their decision making capabilities, computers are gradually replacing many middle management jobs in business, thereby displacing white collar workers who had believed themselves safe from encroaching automation.

The use of computers will be accelerated in the immediate future. As John Diebold recently pointed out, the technological explosion is being given tremendous impetus by the fact that, as computer capabilities are increasing, costs are decreasing. Between 1963 and 1972—a single decade—there will be a

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[11] Donald N. Michael, *Cybernation: The Silent Conquest* (Santa Barbara: Report to the Center for the Study of Democratic Institutions, 1962), p. 5.

decrease of 85 percent in the cost of completing a typical data processing job. During this period, the cost of storage by magnetic tape will go down by 97 percent; the cost of image storage by 96 percent; and communication line costs, because of increased speeds of transmission, will decrease by 50 percent. These changes in economics will mean that we will be able to do more with information technology than we now can even imagine.[12]

In documenting the rapid growth of the computer industry during the past decade and in predicting its growth during the next decade, David Sarnoff, of Radio Corporation of American, points to some impressive statistics:

> In just ten years, the typical electronic data processor has become ten times smaller, 100 times faster and 1,000 times less expensive to operate. These trends will continue, and our national computing power, which is doubling every year, will soon be sufficient to make the computer a genuinely universal tool.
>
> In 1956, there were fewer than 1,000 computers in the United States. Today there are 30,000, or more than $11 billion worth; and by 1976 the machine population may reach 100,000. And these figures will, of course, be greatly increased through the growth of data processing in other nations.
>
> A decade ago, our machines were capable of 12 billion computations per hour; today, they can do more than 20 trillion, and by 1976—a decade from now—they will attain 400 trillion—or about two billion computations per hour for every man, woman and child. Quite evidently, the threshold of the computer age has barely been crossed.[13]

Maintaining that most people's conception of the computer is outmoded, Diebold says that up-to-date systems, rather than being isolated accounting machines, ". . . perform an almost limitless variety of functions, and vary with individual requirements."

> For example, the newest computer systems may appear as input-output units in individual desks; small television-like screens with

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[12] John Diebold, "The New World Coming," *Saturday Review*, July 23, 1966, pp. 17-18.

[13] David Sarnoff, "No Life Untouched," *Saturday Review*, July 23, 1966, p. 22.

> keyboards and copying devices. When you ask a question you see the answer almost simultaneously on the screen. If you want a copy of the answer, you can make it immediately. The heart of the system is a switching center rather like the telephone system. Computers, storage elements of many varieties, and many other devices used as part of the system are accessible as you need them, connected through the switching center to the terminal unit at your fingertips. Thousands of people may use such systems at the same time, and each needs know no more about the operation of the system than the average person knows about the telephone. In the next decade the typical computer system is going to be of this kind.[14]

In "The Great Transformation," H. F. Perk, of Southern Illinois University, former research scientist, graphically and dramatically illustrates the replacement of human functions by machines during the past few hundred years:

Power	Skill	Control	Intelligence	Policy
1. Man	Man	Man	Man	Man
2. Animal	Man	Man	Man	Man
3. Machine	Man	Man	Man	Man
4. Machine	Machine	Man	Man	Man
5. Machine	Machine	Machine	Man	Man
6. Machine	Machine	Machine	Machine	Man[15]

Summarizing the apparent effects to date of the computer, the editors of *Time* comment:

> As the most sophisticated and powerful of the tools devised by man, the computer has already affected whole areas of society, opening up vast new possibilities by its extraordinary feats of memory and calculation. It is changing the world of business so profoundly that it is producing a new era in Arnold Toynbee's "permanent industrial revolution." It has given new horizons to the field of science and medicine, changed the techniques of education and improved the efficiency of government. It has affected military strategy, increased human productivity, made many products less expensive and greatly lowered the barriers to knowledge.[16]

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[14] John Diebold, *op. cit.*, p. 17.

[15] H. F. William Perk, "The Great Transformation," *The American Scholar*, XXXV (Spring 1966), 366.

[16] "Technology: The Cybernated Generation," *op. cit.*, p. 84.

III. The Computer and Other Media in Education

> . . . The notion that education is a powerful force for increasing a nation's wealth—and military power—should have been obvious at least a century ago. But only now that electronic and other technical developments have made it possible for mechanical (and human) brains to displace muscle power does this proposition become common sense. And so it is that hardheaded politicians are willing to *invest* billions of dollars in schooling.[1]

When Lloyd J. Trump predicted in 1961 that the school of the future would feature viewing and listening carrels for individuals, viewing and listening rooms for small groups, with materials regulated through push-button operation from central storage facilities, he probably could not have fully sensed, as did Lady Macbeth, the future in the instant.[2] At what can only be inadequately termed "an accelerating rate," automation has been entering education. Impetus for automated education has been provided by numerous sources, among them B. F.

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[1] Michael Harrington, "Automation: A Revolution That Is," *The New York Times* (advertisement), April 24, 1966, Sec. 11, p. 7.

[2] Lloyd J. Trump, "Images of the Future for School Libraries," *Revolution in Teaching: New Theory, Technology, and Curricula*, ed. A. de Grazia and D. Sohn (New York: Bantam Books, 1962), p. 142.

Skinner, the Harvard psychologist, who believes that the teaching machine through operant reinforcement can often teach better than teachers;[3] the shortage of teachers in numerous disciplines; the mounting expense of education; the nagging guilt among educators that despite decades of talk about the importance of individual differences, formal education has never accommodated itself to individual needs. *Raison d'etre* for the increase of automation in education can be set aside: the increase was and is inevitable. As an institution in a society being totally transformed by electronic media, education cannot escape the transformation, though one can find solace perhaps in hearing and reading "logical reasons" for what changes are occurring.

By 1962 IBM had developed computer-assisted instruction, "based on the simultaneous use of many individual student 'stations' linked to a central computer."

> The system maintains continuous control over a wide variety of learning materials, enabling the individual student to progress at his own rate. At the same time the system evaluates student responses and guides each student separately, to mastery of the subject presented. This device opens the way to the future of programmed instruction and the so-called teacherless classroom, but at the moment demand for the system is hardly widespread.[4]

By the same year the System Development Corporation had developed an automated group education system made of these components:

> . . . a digital computer to control and select the material presented and to analyze responses, a magnetic tape storage unit, a typewriter for printing out data analysis, a slide projector and screen for presenting educational materials, and individual desks with keyboards for the students' responses.[5]

Used in a central facility and with auxiliary equipment, one

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[3] D. S. Halacy, *Computers: The Machines We Think With* (New York: Dell Publishing Co., Inc., 1964), p. 203.

[4] David B. Hertz, "Computers and the World Communications Crisis," *The American Scholar*, XXXV (Spring 1966), p. 268.

[5] Halacy, *op. cit.*, p. 207.

moderately large computer, according to spokesmen for System Development, could serve several schools and teach a thousand or more students simultaneously and individually.[6]

By 1966 computerized instruction and other educational innovations employing electronic media had come a long way, their influence becoming felt from first grade through the not-so-hallowed halls of ivy:

> Starting next fall, 170 first graders at the Brentwood School in Palo Alto, Calif., will be introduced to the three R's by an infinitely patient, infinitely tactful teacher who knows all the answers: a computer.
>
> Other students, from elementary school children to doctoral candidates, have received computerized instruction during experiments, but the Brentwood pupils will be the first in the Nation for whom learning from a computer will be routine.
>
> Every day they and their regular teacher will work with the machine for at least an hour.
>
> The developer of the Brentwood computer's curriculum, Dr. Patrick Suppes of Stanford University's Institute for Mathematical Studies, and other experts in the field view the program as a fascinating social experiment as well as an advanced technology. . . .
>
> Plugged into the computer will be 16 teaching consoles at which children will sit.
>
> Built into each console will be four different modes of teacher-student response—a television screen, a typewriter, a movielike screen and a headset, over which the child gets spoken commands, suggestions and encouragement.
>
> "This capability of speaking to the child is too easy to underestimate," Dr. Suppes says. "It alone puts the computer ahead of all other teaching machines. . . ."
>
> How will the child answer the machine? In three ways—with a pen that casts a beam of light onto the cathode tube at the back of the television screen, over a microphone or by typing his replies onto the teletypewriter. . . .
>
> The computerized teaching machine to be used at the Brentwood School is the first of about a dozen that are expected to be in American classrooms in the next two years.[7]

A coed slides into a plastic chair in a soft green three-sided cubicle, consults a mimeographed list, flips a switch, sees a red

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[6] Halacy, *ibid.*, p, 205.

[7] Thomas O'Toole, "My Teacher, The Patient Computer," *San Francisco Examiner and Chronicle, This World,* April 10, 1966, p. 17.

> light blink, dials 1-2-2, pulls on earphones. Into the headset flows the voice of her political science professor, then Adlai Stevenson on the meaning of democracy, finally a discussion of freedom by New York University's Sidney Hook—and thus ends Lecture 1, Second Semester, Political Science 113.
>
> An electronic approach to teaching at M.I.T.? A far-out experiment at Goddard? Not at all. This is 15-year-old Oklahoma Christian College, a theologically conservative, Churches of Christ-run school, which, though academically obscure, has just opened the nation's first wholly electronic learning center. Each of Oklahoma Christian's 652 students has his own study carrel, tied to a computer that connects him in seconds to one of 46 tape playback machines. The system can transmit as many as 136 programs at once. . . . Whether a professor is really as palatable out of a can as when swallowed live is of interest to those concerned with the growing teacher shortage. To find out, the U.S. Office of Education is spending $70,000 on a two-year evaluation of electronic teaching at Oklahoma Christian.[8]

In a 1964 survey of ninety junior colleges to determine new patterns of internal organization, B. Lamar Johnson found ". . . many innovations in physical facilities—push-button lecture halls, auto-learning laboratories, new television production and reception areas, facilities for live long-distance interviews —and some curricular experimentation: programmed learning, team teaching, independent study, and work-study programs."[9]

At the Center for Research on Learning and Teaching, University of Michigan, work is being focused on the potential of the automated study carrel, which might contain such devices as a tape recorder, slide and 8mm movie viewer, and a TV screen. The carrel might be connected to central computer storage and retrieval. Eric M. Zale reports that "Staff members are aware of the limitations of the machine-operated mode of instruction. It is expected that for every three or four hours the student spends in the carrel, he should meet for approximately one hour in group discussion with other students and with his teacher." Future plans for the Center include both a

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[8] "Education: Colleges—Happiness Is Your Own Carrel," *Time*, February 18, 1966, p. 60.

[9] Logan Wilson (ed.), *Emerging Patterns in American Higher Education* (Washington, D.C.: American Council on Education, 1965), p. 43.

200 carrel complex and seminar-type rooms with the same automated capabilities as individual carrels.[10] In a report on the Center's activities, Stanford C. Ericksen, director, advised the Michigan faculty that it is essential, as technology becomes an intrinsic part of the instructional process, ". . . that college faculties become acquainted with and explore the educational contribution of the computer and other technological aids for teaching."[11]

A recent newspaper article reported that C. Deighton, of The Macmillan Company, delivered a speech to the printing industries of metropolitan New York in which he described an audio-dial-access system on the campus of the Ohio State University. "Student use has reached 40,000 dial calls a week. Students may dial for 8,000 programs . . . from a reading of Chaucer to a lesson in Chinese."[12]

In a paper first published in the *American Behavioral Scientist*, November 1962, Livio Stecchini, Paterson State College, foresaw teaching machines as a means of improving instruction at the college level. Pointing out that instruction at lower levels undergoes continuous scrutiny and evaluation, Stecchini lamented that college teaching, which he believed inferior, had never been considered.

> . . . College education has been molded most crudely by the industrial revolution: courses are conceived as interchangeable parts worth so many points, and teachers and students are expected to deliver so many hours of physical presence accompanied by a specific set of mechanical operations. Now, the teaching machine, which reflects the second industrial revolution or automation revolution, through the process of feedback provides a continuous testing, both of the learning by the student and of the instructional effectiveness of the program.[13]

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[10] Eric M. Zale, "Where They Learn About Learning," *EDUCOM*, February 1966, p. 3.

[11] *Ibid.* p. 7.

[12] Harry Gilroy, "Will the Wizard Respect Copyright?" *San Francisco Examiner and Chronicle, This World*, February 27, 1966, p. 39.

[13] Livio Stecchini, "Prospects in Retrospect: On Educational Technology," in *Programs, Teachers, and Machines*, ed. A. de Grazia and D. Sohn (New York: Bantam Books, 1962), p. 27.

Patrick Suppes, developer of computer curriculum at Brentwood School, distinguishes between teaching machines and computer-based systems, insisting that the latter can do that which the teaching machine could not do—individualize instruction.

> Computer-based teaching systems, designed to aid the teacher in the individualization process, consist of a variety of student-operated instructional devices. These learning machines are not to be confused with the large class of so-called "teaching machines" of recent years—frequently identified with the educational process of programmed learning. Typically, these mechanical devices dispense instructional material in a fixed sequence of small, easy-to-take steps of one or two sentences, usually followed by a question. All students traverse the same sequence regardless of differences in background and aptitude. With computer-based teaching devices, however, the student will study a sequence that is tailored to his individual needs. This flexible system will differ from the non-computerized teaching machine in responsiveness to different learning problems, both as they occur or as they have been anticipated on the basis of previous experience with a student.[14]

Suppes believes that the greatest asset of the computerized system is its ability to enable the teacher and researcher to learn about individual students as they are in the process of learning. Further, he maintains the computer system is superior to teaching machines in that it not only stores and analyzes learning data while students are using the machines but automatically evaluates and modifies the curriculum as a consequence of its analysis.[14]

That the computer and other electronic media will become increasingly important in all aspects of higher education was assured by the formation of the Interuniversity Communications Council (EDUCOM) in mid-1965. Its founding was supported by a $750,000 five-year Kellogg Foundation grant for administrative operations. The Council started as an association of six universities, among them the University of California, and has since grown to include seven universities with

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[14] Patrick Suppes, "Plug-In Instruction," *Saturday Review*, July 23, 1966, p. 25.

more than 120 campuses. These campuses enroll an estimated one third of the students in American universities.

A nonprofit corporation, the Council's central purpose is "To provide collaboration among institutions of higher learning in their efforts to utilize the emerging communications sciences . . . ," for its founders believed ". . . that only through cooperation can the academic community make a maximal contribution to these new concepts and systems." The Council is concerned with all information process activities—computerized programed instruction, library automation, educational television and radio, and the use of computers in university administration, in research, and in clinical practice. Eventually, the Council may cooperate with secondary and elementary schools in improving instruction. Membership in the Council is institutional, costs $250.00 upon admission and a like amount in annual dues, and allows for one representative from each institution. Every accredited college and university in the United States will be invited to join.[15]

A further aim of EDUCOM is to promote within an institution cooperation in the uses of new educational media. At the University of California, Donald M. Hatfield, who supervises teacher education in science and the educational media laboratories, is chairman of a universitywide committee to coordinate information processing activities among the nine campuses. The committee intends to study methods of computerizing intercampus communications so that information available on one campus can be transmitted instantaneously to another.[16]

The influence of the computer and other electronic media at *all* levels of education is further assured by recent mergers of publishing houses and electronic industries: IBM has acquired Science Research Associates; Raytheon Company has purchased D. C. Heath; Xerox Corporation has bought American Education Publications and Basic Systems, Inc.; Random House, after purchasing Knopf, has merged with Radio Corporation of America, a merger which Bennett Cerf, chairman of

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[15] *EDUCOM*, January 1966, inside cover.

[16] "Hatfield Heads Communication Committee," *School of Education Newsletter* (Berkeley: University of California, April 1966), p. 3.

Random House, said espoused ". . . our conviction that publishing and electronics are natural partners for the incredible expansion immediately ahead for every phase of education in our country";[17] Sylvania Electric Products, Inc., and the Reader's Digest Association, Inc., announced in March the formation of a joint group to investigate the potential of electronic systems in education. Purpose of the investigation, according to Gene K. Beare, president of Sylvania, and Paul W. Thompson, executive vice president of Reader's Digest, is to

> combine Sylvania's knowhow in the field of electronics and communications with the writing, editing and publishing skills of Reader's Digest for the purpose of developing advanced methods of instruction that will improve educational programs.[18]

Most portentous perhaps for the future direction of American education was the resignation of Francis I. Keppel from his post as Assistant Secretary for Education to become board chairman of the General Learning Corporation, a subsidiary company formed last November by Time, Inc., and General Electric, with merged assets of $37.5 million. According to the news story announcing Keppel's resignation, "the firm will develop and market educational materials, systems and services, combining the printed word with new electronic devices such as computers and other automated learning."[19]

How the teacher will fare in the automated future can be only conjectured. Lilyn Carlton facetiously leaves no room for the schoolmarm in the poem "Teaching Machine Age,"

> In the good old-fashioned school days,
> Days of the golden rule,
> Teacher said, "Good morning, class,"
> And so she started school.
>
> Alas: How different things are now.
> The school day can't begin

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[17] "New Electronic Education Link," *San Francisco Chronicle*, March 1966, p. 54.

[18] Gilroy, *op. cit.*

[19] "Top U. S. Education Aide Quits," *San Francisco Chronicle*, April 10, 1966.

> Till someone finds the socket
> And plugs the teacher in.[20]

Though the teacher may not be eliminated, his number may be reduced considerably and his role redefined. John E. Coulson, of System Development Corporation, foresees the end of the teacher as primarily a transmitter of information:

> Individualized instruction by computers and by other self-study techniques will certainly require drastic changes in the role of the teacher. His job will no longer be primarily to present information and to drill students. He will spend most of his time in diagnosing individual learning problems, remedying them in close tutorial interactions with the pupils, and leading group discussions. He will be required to coordinate the use of many instructional materials and media that will be available to him, including conventional textbooks and laboratory projects as well as programmed instruction, and will have to decide which procedures will be most effective for students with different learning needs. The teacher will be aided in these diagnostic and remedial functions by computer-generated displays that will alert him automatically to excessive student errors and provide him with detailed information about any particular student's progress at that moment in his studies.[21]

William A. Deterline, American Institute of Research, believes that programed instruction (P.I.), rather than displacing the teacher, will profoundly affect the traditional textbook:

> Textbooks did not replace teachers; laboratory and field work did not replace teachers; and it is unlikely that P.I. will replace teachers, although it is certain that, given time, the conventional classroom will be markedly affected by the integration of P.I. along with existing instructional systems. Although the classroom-teacher role is the one most often compared with the tutorial characteristics of P.I., there is another classroom instructional source that will be more profoundly affected by P.I.—the textbook. Several opinion surveys conducted among students who had used programs indicated that although students react favorably to programs, it is the

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[20] Halacy, *op. cit.*, p. 199.

[21] John E. Coulson, "Automation, Electronic Computers, and Education," *Phi Delta Kappan*, XLVII (March 1966), 341.

> unprogrammed textbook, not the classroom instructor, that the students would like to see replaced.[22]

By freeing the teacher from drudgery, scientific methodology can eliminate the "fake" distinction between teacher and scholar, can enlist elementary school teacher and university professor under a single banner, and can bring about a rapprochement between educator and scholar, between public school and liberal arts college, between teacher and critic, and between student and teacher, according to Kenneth S. Rothwell, University of Kansas.[23]

R. Buckminster Fuller envisions the time when all formal education until graduate school will take place in the home, although students may attend school houses for social experiences or to be "baby-sat."[24] Outstanding scholars, Fuller believes, will contribute their thinking to the production of television documentaries which can be selectively beamed via tiny lasers or masers into individual homes. Careful production of the documentaries on university campuses would free scholars from routinely giving lectures and would return them to their studies, Fuller asserts. The documentaries would be carefully reviewed from time to time to make sure they were up to date.[25]

> With two-way TV we will develop selecting dials for the children which will not be primarily an alphabetical but a visual species and chronological category selecting device with secondary alphabetical subdivisions. The child will be able to call up any kind of information he wants about any subject and get his latest authoritative TV documentary, the production of which I have already described to you. The answers to his questions and probings will be *the best information* that man has available up to that moment in history.

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[22] William A. Deterline, "Human Systems and Programed Instruction," in *Programs, Teachers, and Machines, op. cit.*, p. 123.

[23] Kenneth S. Rothwell, "Programed Learning: A Back Door to Empiricism in English Studies," in *Programs, Teachers, and Machines, op. cit.*, p. 204.

[24] R. Buckminster Fuller, *Education Automation: Freeing the Scholar to Return to His Studies*, (Carbondale, Illinois: Southern Illinois University Press, 1964), pp. 41-43, 50.

[25] *Ibid.*, p. 36.

> All this will bring a profound change in education. We will stop training individuals to be "teachers," when all that most young girl "education" students really want to know is how they are going to earn a living in case they don't get married. . . .[26]

As strange as this prediction may sound, it is supported by Coulson in these remarks:

> The problem of limited classroom space may be relieved by using remote instructional stations connected to a centralized computer by telephone lines. Each student could spend a large part of his study time at a station located in his own home. Space at the school could then be reserved largely for activities requiring student-staff interactions, such as individual counseling, tutoring, and group discussions, and for activities requiring specialized equipment, such as laboratory projects.[27]

Already students are using the computer to solve homework problems. A newspaper story recently described how six Queens high school students

> . . . sit by the telephone, punch out their homework problems on a push-button dial, and get the answers instantly.
>
> Working with a computer they've never seen, the students can solve any math problem from two-plus-two to the square root of a 14-digit number.
>
> The "dial-a-solution" project is a joint study being conducted by the Roman Catholic schools of the Diocese of Brooklyn and International Business Machines Corporation.
>
> The students work at home with a 12-button dial that relays commands to an IBM 1710 computer 50 miles away at Yorktown Heights in Westchester County. The answers come back by prerecorded voice. . . .
>
> The day is not far away when the computer will provide a vast storehouse of human knowledge to every student over the telephone, predicts Brother Austin David, F.S.C., data processing consultant for the diocese.[28]

It is difficult to foretell the long range effects, salutary or detrimental, this automated instruction will have upon stu-

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[26] *Ibid.*, p. 43.

[27] Coulson, *op. cit.*, p. 342.

[28] "Students Who Do Their Homework by Computer," *San Francisco Chronicle*, April 14, 1966.

dents. Coulson candidly admits that programers are ignorant about what the social and emotional effects of individualized instruction will be on students, particularly on younger children. He recognizes that harmful psychological and sociological effects can accrue from allowing a child to pace himself, for his scholastic peers may be quite different from his social peers. "The most acute and challenging problems in the application of modern data processing technology to education appear to be in the human factors field rather than in the equipment field."[29]

One person who believes strongly in the use of electronic communications at least at the university level is Robert D. Tschirgi of the University of California system. Tschirgi is quoted in *EDUCOM* as having said in a paper delivered in December before the American Association for the Advancement of Science at Berkeley:

> The currency of a university is information, and it is the creation, storage, manipulation and dissemination of information which is the primary business of any university. Far from dehumanizing the educational process, the optimum use of electronic communication devices restores the human to the central role of communicator, allowing him to inject his personality more directly across time and space. The feeling of warm, personal friendship, or on the other hand, deep hostility, which television viewers develop towards performers is clear evidence of the human intimacy possible through even one-way television communication.[30]

The one prediction that can safely be made is that the use of automated instruction will continue to proliferate; for the confluence of forces seemingly affecting the future of education —the shortage of teachers, the increasing costs of public education, the mergers of publishing houses and electronic industries, the oft expressed desire of educators to individualize instruction—all feed into the electronic revolution, the inexorable force transforming not only education but the whole of society. Since the revolution may lead to the greatest advance

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[29] Coulson, *op. cit.*, p. 344.

[30] Tschirgi, Robert D., "Loving a Computer-Tutor," *EDUCOM*, February 1966, p. 9.

in human learning in man's history, educators at least have reason to be optimistic:

> . . . You can take a field of mathematics and axiomatize it and get it down to a static nutshell: a beautiful kernel, a thing that a mathematician thinks is just lovely. And maybe you can get somebody to memorize it; but if he does so, he has not learned a thing. The only way to get it into the person is to blow it up into 50,000 operations and teach it from many points of view, using many examples. Finally it gets down into his brain in a little kernel: a beautiful pearl of knowledge.
>
> This process is just killing us. We don't have enough teachers to handle it. University professors leave universities because of it. Computing machines, as Perlis pointed out, can do this kind of thing rapidly, economically, patiently, and without the frustration and the unhappiness. I think the computer offers a real match to the problem of getting knowledge into human skulls.[31]

If computers didn't exist, a modern Voltaire would insist that they, like God, would need to be invented, even if it were only to catalogue, store and retrieve man's burgeoning knowledge. Traditional ways of classifying and housing library materials will no longer do. To acquaint its readers with both the rate at which information is being published and the need for using computers in libraries, *Time* reported last September that

> Unless even the best schools find ways of keeping current with new information, they too will run into incalculable trouble. Last year alone, 20,542 new books and 7,909 new editions of older books were published in the U.S.—nearly twice the number that came out in 1960. In addition, 22,262 periodicals and 80,000 technical reports rained off the presses. . . .
>
> About 90% of all scientists who ever lived are now at work—and, it seems, most are publishing their findings. In 1750 there were about ten scientific journals in the world; today there are about 7,000 related to the biomedical sciences alone. Once scientists wrote about physics, chemistry and biology; today they deal with the likes of bio-chemistry, bio-engineering, exobiology and biophysics. In 1950, chemists produced 558 articles every two weeks for their publications; in 1965, in the field of chemistry alone,

[31] Alan Perlis, "The Computer in the University," in *Computers and the World of the Future*, ed. Martin Greenberger (Cambridge: Massachusetts Institute of Technology Press, 1962), p. 216.

> those learned explorers are turning out—and publishing—6,700 articles every fortnight. Small wonder that the U.S. Printing Office is drawing up plans for a new building with 40 acres of working space—six acres bigger than the Pentagon; or that Yale, if it were to continue using its obsolescent card catalogue, would need eight acres of floor space by the year 2040 just for the cards alone. The books would be virtually unhousable.[32]

The article then proceeds to relate that academic libraries are planning to tie themselves together electronically so as to benefit from each other's resources; that eventually, according to James Miller, executive director of EDUCOM, there will be a network of bookless libraries—study booths, electric typewriters and TV screens—in which "a small college will be able to have a better library than Harvard has now"; that the real key to progress is automation of the Library of Congress, which now has 40 million 3-by-5 cards in its files.

> . . . Converting that catalogue to tapes for computer use would cost about $40 million—but a librarian anywhere in the U.S. would then have a constantly updated index to all U.S. publications. The Library of Congress could use a Data-Phone system to flash information by ordinary telephone line to any library that requests it. The system, already employed for high-speed communications, uses perforated tape that transmits signals to remote printing machines at the rate of 6,000 words per minute—all for the price of a long-distance telephone call.[33]

Already computerized is the National Library of Health in Bethesda, Maryland, which tries to acquire every publication relating to medicine:

> . . . Librarians feed selected references from articles in 2,400 periodicals into two Honeywell computers. Then, by the use of key words, the computers each year arrange 150,000 citations alphabetically. This list is printed by a computer-driven phototypesetter, and the result is a book, the *Index Medicus*, which goes to 7,000 libraries around the world.[34]

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[32] "Education: Libraries," *Time*, September 3, 1965, p. 52.
[33] *Ibid.*, p. 57.
[34] *Ibid.*

Coulson maintains that the use of automated information and document retrieval techniques can greatly aid the school librarian. In some detail he describes how the computer can catalogue documents and how it can facilitate search for reference materials:

> . . . An increasing number of documents and periodicals are automatically type-set from coded material on magnetic or punched tapes. These tapes can be read directly by a computer, which can automatically catalogue every new library acquisition. The computer can not only catalogue by title and author, it can also perform a content analysis of the book or magazine and automatically index the material by subject matter. Furthermore, it can display the title, author, and library number of books and magazines having any combination of subject matters that the student, teacher, or librarian may specify. Suppose, for example, that a student asks for reference materials on Canadian use of cybernetics in education. The computer might search its files under the index category "education," then "Canada," and finally "cybernetics." This search would produce three different lists, which the machine would examine for overlap. Within a few seconds it would print out the identification of materials having some reference to education, Canada, and cybernetics. If it could not find anything with all three categories, it would list the materials coming closest to the student's request.[35]

John G. Kemeny, Dartmouth, foresees by the year 2000 a National Library from which students and teachers will retrieve information by dialing, employing a three-digit code for the subject, a two-digit code for the branch of the subject, plus a three-digit code for a specific item within the branch: in short, a nine-digit code. Kemeny believes that the National Library will be connected to colleges and universities by means of multichannel cable on which pictures can be transmitted; that institutions will have numerous reading rooms containing reading units similar to microfilm readers but equipped with tape units capable of receiving pictures from the central library, each picture representing one page; and that individuals will furnish their own tapes, upon which will be copied electronically material from tapes in the National

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[35] Coulson, *op. cit.*, p. 342.

Library. Once he has finished reading, the student or professor may keep the taped material for his personal library (a $10.00 tape can store ten volumes) or reuse the tape next time.[36] Kemeny even believes that publications, as we now know them, may cease to exist:

> It is also safe to predict that the effect of such a library on the very nature of research will be immense. I don't care to explore this subject too far, for fear of sounding fantastic, but I do want to raise one possibility. Isn't it conceivable that the nature of publications will change? Why should we continue to publish hundreds of journals in each subject, when the simple act of depositing an item in the National Library would accomplish more? We can visualize a time when a research article in mathematics is simply submitted to the "mathematics editorial board" at the National Library, where it would receive the customary referees' treatment. Once it is accepted, it is filed into the National Collection, together with an abstract of the accepted format, on the next 13th of the month. Any library or individual would have access to it after that and could obtain a copy of it by the procedure described earlier. The time of "publication" could be cut to about three months from the present two years, and the cost would return to normal proportions.[37]

When one considers the difficulty publishers are having today protecting copyrighted material (as McLuhan has observed, with available electronic equipment, almost every office is now in the publishing business), Kemeny's notions may not be outlandish: the number of retrievals of a work from the National Library could be automatically tabulated, somewhat in the way that telephone message units are presently tabulated, and royalties paid accordingly.

During the past decade there has been constant refinement of the process by which photographic material is reduced for easier storage. Visitors to the World's Fair in Seattle who previewed the computerized information center of the future, Library 21, were shown a photo process that reduces a 400-page

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[36] John G. Kemeny, "A Library for 2000 A.D.," *Computers and the World of the Future, op. cit.*, pp. 147-149.

[37] *Ibid.*, p. 161.

book to the size of a postage stamp for storage.[38] While discussing the implications of Kemeny's paper on the library of the future, Gilbert W. King, director of research for IBM, observed that

> The National Bureau of Standards has demonstrated how photographic material can be reduced by a factor of 1000 linearly, which is a factor of 1,000,000 in area. Enough work has been done along these lines to show that all volumes of the Library of Congress could be stored in a 1-cubic-yard box. Of course, the question is what to do with it once you have it there, and this question is still largely unanswered.[39]

One can anticipate that the future uses of the computer in the university will go well beyond those of the present; the computer will not only be heavily involved in performing research activities, it will help administer an institution and coordinate it with other institutions.

> . . . I think it will participate in almost every intellectual transaction that goes on in the university. . . . As part of its contributions to the intellectual process, the computer will explore consequences of assumptions. It will present complex systems of facts and relations from new points of view, "cutting the cake another way" in a fraction of a second. It will test proposed plans of action through simulation. It will mediate and facilitate communication among human beings. It will revolutionize their access to information. It will even obtain for them the aid and services of other digital computers. At first the computer will be, in Perlis' term, a "handmaiden to scholarly university activities." In not many years, however, it will be regarded less as a handmaiden than as a partner.[40]

Duke University, the University of North Carolina, and North Carolina State University have joined to form the largest educational computing complex in the world, the Triangle Universities Computation Center (TUCC) near Durham. Supported by a $1.5 million grant from the National Science Foundation, the facility will have a leased IBM System 360/Model 75, a computer that can add 1 million 10-digit num-

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[38] Halacy, *op. cit.*, p. 209.
[39] Kemeny, *op. cit.*, p. 166.
[40] Perlis, *op. cit.*, p. 206.

bers in less than a second. Model 75 will be tied by telephone lines to System 360/30s on the three campuses, "as well as to low-speed typewriter and medium-speed terminal devices installed at various places at the Universities." A variety of disciplines, among them medicine, engineering and statistics, will share time. Ultimately, planners hope to extend by telephone lines the services of the facility to at least 76 other institutions in the state.[41]

Urging further cooperation among universities, Tschirgi said to the American Association for the Advancement of Science,

> With many vital functions which affect the university, such as testing, planning and innovation, increasingly organized and managed by forces outside the university, the salvation of the uiversity's integrity is not in isolation or institutional independence, but in close cooperation with other universities. . . .
>
> I anticipate the time when the geographical separation of universities will hardly enter into the consideration of educational activities. The electronic transmission of information should be made so simple and complete that the lack of physical presence goes relatively unnoticed.
>
> Cooperative research projects can be undertaken between faculty members on different campuses with little concern for physical discontinuity, and all library and data process facilities should be mutually available throughout the university system.[42]

Believing that knowledge *about* and *of* the computer will be essential to the educated man in the future, Alan J. Perlis, Carnegie Institute of Technology, recommends for all university students a mandatory course in programing and using computers:

> . . . it is felt that the first student contact with the computer should be at the earliest time possible: in the student's freshman year. This contact should be analytical and not purely descriptive, and each student during this first course should program and run or have run for him a large number of problems on the computer. At least in engineering and science programs, this course should

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[41] "A Chatty Computer in Room B-3," *EDUCOM*, March 1966, p. 7.
[42] Tschirgi, *op. cit.*, p. 9.

share with mathematics and English the responsibility of developing an operational literacy, while physics and chemistry develop the background toward which this literacy is to be applied. In a liberal arts program the course could be delayed until the sophomore year, but certainly deserves inclusion in such a program because of the universal relevance of the computer to our times.[43]

Experience in programing is being provided to some students at earlier educational levels than Perlis had considered—in high school and in grade school. What is not yet a trend may become one as more computers are used in elementary and secondary schools:

Members of the Class of '65 at Altoona, Pennsylvania, Senior High School graduated with a distinction. They were the last to leave the school without experience in computer programming.

Succeeding classes, in fact 1,000 of the school's 3,300 students, already were learning the operation of a General Electric 215 as a part of regular science and mathematics courses. The computer was installed in September 1964 in a basement classroom.[44]

Room B-3 is the province of an anthropomorphic IBM 1620 that refers to itself as "the friendly computer," and which 100 or more grade-school children engage each day in remarkably casual communication. After a few formalities, the machine often opens one of these dialogues by typing out: "Hello. I hope we will be able to have a good conversation. Please type your name the way you would like me to address you. When finished, press the key with R-S on it."

A small boy ponders the invitation on the electric typewriter that is the computer terminal. He leans over, hunts, and patiently pecks: "Tim R-S."

"I'm glad to meet you, Tim," replies the 1620. "I don't believe you have talked with me before." Within minutes, and here is the purpose behind the banter, Tim is responding on the keyboard to a test devised by his own classmates.

Machines are used increasingly to aid in instruction. But the experiment in the Dixie School District, of which Vallecito is part, on the hilly peninsula north of San Francisco's Golden Gate Bridge, differs in purpose. There, the object, as defined by Dr. John A. Starkweather, the University of California psychologist whose idea

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[43] Perlis, *op. cit.*, p. 188.
[44] *EDUCOM*, January 1966, p. 8.

> it was, is to foster "skill in questioning and problem solving through the programming efforts of the pupils . . ."
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> "The notion of the project . . . took on the form of the advantages to the kids to be derived from the actual practice of programming," Starkweather recalls.
>
> "In order to write a sequence of questions, they would be forced to think of all the potential answers they would be willing to consider correct—and to predict the kinds of responses and terminology that someone taking such a test might use. . . ."
>
> Finally, the U.S. Office of Education decided to support the study for two years, effective last fall, through a contract to the University. . . .[45]

James McClellan, Teachers College, warns that either we take machines for programed instruction into "the mainstream of educational practice" or they will take us, a sober but suitable note on which to end this section of the paper:

> You can see, I think, that our efforts to keep the role of teacher single and undiscriminating, our egg crate conception of school architecture, our notions of lay control, and all the rest of our mythologically based ideas of education will have to go when we take the programing seriously. But that is exactly what we will have to do. For, if the history of technological change is any guide, it seems clear that if we do not take these machines, they will take us. I should much prefer that we take them into the main stream of educational practice rather than leaving them on the outside as marginal and distractive influences.[46]

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[45] *EDUCOM*, March 1966, pp. 3-5.

[46] James McClellan, "Automated Education," in *Programs, Teachers, and Machines, op. cit.*, p. 116.

IV. Glimmerings of Utopia

What profound detrimental effects cybernation may have upon the society and its institutions has concerned many. Michael warns that one characteristic of selectively increased cybernation is that its ill effects will at first only be felt locally and may not be recognized either by those who introduce it or by the government as a national problem, one affecting the whole social system. "By the time the adverse effects of cybernation are sufficiently noticeable to be ascribed to cybernation, the equipment will be in and operating."[1] He believes that our chief concern must be the transitional period between the present and the future when hopefully people will have more leisure time and the security to enjoy it.[2] And he sees education as the institution most important for this period of transition:

> Education must cope with the transitional period when the disruption among different socio-economic and occupational groups will be the greatest; and the later, relatively stable period, if it ever comes to exist, when most people would have adequate income and shorter working hours. The problem involves looking ahead five, ten, twenty years to see what are likely to be the occupational and social needs and attitudes of those future periods; planning the intellectual and social education of each age group in the numbers needed; motivating young people to seek certain types

[1] Donald N. Michael, *Cybernation: The Silent Conquest* (Santa Barbara: Report to the Center for the Study of Democratic Institutions, 1962), p. 28.
[2] *Ibid.* p. 29.

> of jobs and to adopt the desirable and necessary attitudes; providing enough suitable teachers; being able to alter all of these as the actualities in society and technology indicate; and directing the patterns of cybernation so that it fits with the expected kinds and distribution of abilities and attitudes produced by home and school. . . . All we have at present is the hope most people can be educated for significant participation in such a world as we have foreseen here—we have no evidence that it can be done.[3]

Robert McClintock, of Johns Hopkins University, expresses fear that our ability to design computers is *already* beyond our ability to control them adequately:

> In the field of computer design the most severe lack of knowledge is not how to design and build bigger and faster machines, but how to make them function, how to integrate them into the human world, and how to make them do what we want them to do. Norbert Wiener's later writings harped upon the dangers we risk by building machines to perform functions that we do not adequately understand. The dangers are real because our ability to design machines is more fully developed than is our ability to understand the purposes to which they might be put; and we could end by putting electronic machines to uses we would not want to put them if we really understood what the uses were.[4]

McClintock's fear is shared by Daniel Tanner, Northwestern University, particularly in regard to the uses of cybernation in education. Though he recognizes educational critics' impatience with the inefficiencies of schools and their desire to reduce educational expenditures by using highly efficient autoinstructional devices, Tanner cautions that we must bear in mind "that while the product of industry is an automobile, a refrigerator, or a washing machine, the product of education is a human being."[5] Moreover, one might be rightfully concerned whether education can, as Michael believes it must, respon-

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[3] *Ibid.* p. 41.

[4] Robert McClintock, "Machines and Vitalists: Reflections on the Ideology of Cybernetics," *The American Scholar*, XXXV (Spring 1966), p. 254.

[5] Daniel Tanner, "The Machine Teacher and the Human Learner," in *Programs, Teachers, and Machines*, ed. A. de Grazia and D. Sohn (New York: Bantam Books, 1962), p. 308.

sibly educate people to use cybernation for the greatest social good when education as an institution is, itself, becoming increasingly cybernated. Perspective on the forest is difficult when one is among the trees.

With few exceptions, the audioinstructional programs now being used in the schools have not been adequately developed through a series of empirical trials and revisions, Coulson maintains. He reminds us that regardless of how well designed equipment may be, "no instructional system can be of practical value unless it contains effective content materials."[6] Gotkin reports that the single most common comment students make about programed instruction is that it is a boring way to learn, though he adds that most people find textbooks boring. He points out that programed instruction does not allow the student to "tune out," as he can in a regular classroom situation. When a student reports he is bored, he may mean that the program is making inordinate demands upon him or that it is presenting material he considers beneath his ability.[7] Gotkin feels that programs fail to be interesting because of their lack of "style," not because of their attempt to be all things to all students.

> . . . If one judged the personality of programmers from their products, one would be led to the conclusion that they were a dull lot, devoid of those attributes that characterize creative persons. David Markel (in conversation) suggested that the reason programmers, who as persons are rarely dull, produce such dull products results from the singleness of purpose with which they zero in on their topic. The programmer becomes so intent upon reaching his objective he fails to comment upon the scenery. Markel's insight is reminiscent of Holden Caulfield's comments in *The Catcher in the Rye* as to why he hated his speech class. Every time a speaker wandered from his subject the children were to interrupt by raising their hands and shouting, "Digression, digression." The digressions for Holden were the most interesting parts of the speeches.[8]

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[6] John E. Coulson, "Automation, Electronic Computers, and Education," *Phi Delta Kappan*, XLVII (March 1966), 343.

[7] Lassar G. Gotkin, "Programed Instruction in the Schools," in *Programs, Teachers, and Machines*, *op. cit.*, p. 167.

[8] *Ibid.*, p. 170.

Assuming that we do survive the transitional period that Michael fears may be anarchical; assuming that we do learn to master, rather than be mastered by, our machines; assuming that cybernation can be used in education to further man's creativity as well as his intellect, what kind of future world may we have?

We can safely predict that it will be smaller than today's globe, for it will be girdled by electronic devices that enable all mankind to be in instant communication.

> If we had satellite vision today, you'd need but a one-rod, rooftop antenna to pull perfectly beautiful pictures from a satellite whirling high above the earth. . . . At a Hollywood industry banquet this month, RCA board chairman General David Sarnoff flatly predicted, "By the mid-70's and possibly sooner, high power broadcast satellites will beam television programs and motion pictures directly to home receivers anywhere in the world."
>
> Four years ago, while addressing the American Bar Association in San Francisco, seer Sarnoff spelled out the details: "In its advanced form, I believe, our space communications system will consist of three synchronous satellites, each positioned about 22,300 miles above the equator. Moving at a speed matching that of the earth's rotation, they will in effect hover over a fixed point on its surface. Three such satellites, one each over the Atlantic, Pacific and Indian Oceans, would cover the entire global area except the polar region. . . ."[9]

Sarnoff's predictions are supported by Vincent Rock, director of Communications Central, a Washington organization dedicated to the global uses of technology:

> In a few years, shortly before or after 1970, broadcast satellites with sufficient power to permit direct reception by conventional home television sets will be available. These third generation satellites can have capacity equivalent to 10,000 simultaneous telephone lines. Multiple access by many sending stations will become possible.
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> In the 1970's, for the first time in the history of man, we will have a world communications system which is not only global in scope

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[9] Dwight Newton, "New Ways to Televise," *San Francisco Examiner*, March 20, 1966.

but capable of a universal reach.

The distinction is important. What we now refer to as a global system will permit communication via the whole range of media among no more than a fourth of the world's people, probably considerably less. In contrast, in the 1970's we can, if we wish, have a system that provides communication among nine-tenths of the world's population.[10]

Tschirgi believes that universities need to establish a priority of electronic networks, including international networks:

(1) Archival networks to provide universal availability to the world's literature. (2) Interuniversity networks to enable coordination of archival, administrative, research, and educational functions. (3) University-community networks for dissemination of extension education and general-interest programs. (4) International networks, through which the community of scholars can become the community of mankind.[11]

In his keynote address at Vision 65, R. Buckminster Fuller announced that a great computer feeding game, called "How to Make the World Work," was to be established at the Carbondale campus of Southern Illinois University. People from all over the world would be invited to Carbondale to test their theories. If the computer predicts that the theory will lead to war, the person or team proposing that theory loses the game. Essence of success, on the other hand, in playing the game

. . . will be to make every man able to become a world citizen and able to enjoy the whole Earth, going wherever he wants at any time, able to take care of all the needs of all his forward days without any interference with any other man and never at the cost of another man's equal freedom and advantage.[12]

In 1962 Halacy had predicted the inevitability of an electronically integrated world:

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[10] Vincent P. Rock, "Universal Education By Satellite," *EDUCOM*, I (May 1966), 9.

[11] Robert D. Tschirgi, "Loving a 'Computer-Tutor'," *EDUCOM*, February 1966, p. 9.

[12] R. Buckminster Fuller, "Keynote Address, Vision 65," (Carbondale, Illinois: Southern Illinois University Press, October 1965), p. 12.

> . . . Despite temporary setback of war, protective tariffs, insular tendencies, and the like, in the long run we will live in one integrated world shrunk by data links that can get information from here to there and back again so fast it will be like conversing with someone across the room. Already planners are talking worldwide computerized systems.[13]

In a speech abstracted in *Computers: The Machines We Think With*, Simon Ramo, of the University of California at Los Angeles, predicted in 1961 that

> . . . Intellectronic legislation will extend beyond a single country's boundaries in international cooperation. It will smash the language and communication barriers. It will permit and implement not only global prediction of weather, but global control as well. Because of the rapid handling of vast amounts of information, man can form more accurate and more logical concepts that will lead to better relations throughout the world.[14]

In such a world, language may no longer be a barrier to understanding: Fuller believes it is possible for the computer "to find the most commonly recognizable and speakable sound and meaning relationships common to all world people" and to "develop some kind of phonetic acceleration leading toward a common world language."[15] McLuhan goes so far as to predict that, as the computer frees people from using language as a means of classifying data or meanings, the future of language "presents the possibility of a world without words, a wordless, intuitive world, like a technological extension of the act of consciousness."[16]

One of modern man's most persistent fears has been that the earth lacks sufficient natural resources to sustain everyone adequately. This fear, supported perhaps inadvertently by Darwinism and certainly given credence by Malthusianism, has psychologically underpinned numerous wars. The fear is

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[13] D. S. Halacy, *Computers: The Machines We Think With* (New York: Dell Publishing Co., Inc., 1964), p. 230.

[14] *Ibid.*, p. 237.

[15] Fuller, "Keynote Address," *op. cit.*, p. 31.

[16] Marshall H. McLuhan, "Address at Vision 65," *The American Scholar*, XXXV (Spring 1966), 205.

now anachronistic according to both Simon and Fuller. Of the two, Simon is the more conservative:

> The productivity revolutions have opened the realistic prospect of a world in which the basic physical needs of all men (not only citizens) can be satisfied without shackling anyone in slavery or excessive toil. The population explosion—an unintended consequence of the revolutions—may push that prospect a little further into the distance, but it is unlikely to delay it more than a few generations. To these developments, however, the computer contributes little that is qualitatively new; at most it increases a bit the rate of change.[17]

Twice at the Vision 65 conference, once in his keynote address and once in his concluding address, Fuller asserted his belief that man need no longer suffer physical want:

> Only one decade ago, at the meeting in Geneva and its companion meeting of the Food and Agricultural Organization it came so clearly into scientific view that the leading world politicians could acknowledge it to be true that—as reported unequivocably by Gerard Peil, publisher of the *Scientific American—for the first time in the history of man, it was in evidence that there could be enough of the fundamental metabolic and mechanical energy sustenance for everybody to survive at high standards of living—and furthermore, there could be enough of everything to take care of the increasing population while also improving the comprehensive standard of living.* Granted the proper integration of the world around potentials by political unblockings, there could be enough to provide for all man to enjoy all Earth, at a higher standard of living than all yesterday's kings, without self interferences and with no one being advantaged at the expense of another.[18]
>
> . . . A physicist of Chicago University, John R. Platt, surveying general world trends and basic data, says, "The world is now too dangerous for anything but Utopia."
>
> Unfortunately, we now view Utopia as unfeasible. Our attitude is derived from the fact that all attempts to establish Utopias occurred when there wasn't enough to support more than one percent of humanity, whereas it is fundamental to Utopia that there must be enough for all. For the last ten years the by-product more-with-

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[17] Herbert Simon, "A Computer for Everyman," *The American Scholar*, *op. cit.*, p. 26.

[18] Fuller, "Keynote Address," *op. cit.*, p. 6.

> lessing of prime weapons development has made it visible that there can be enough to go around—handsomely.[19]

Believing the content of every new medium to be derived from a preceding environment, McLuhan says the earth can become the content for the new space environment created by its satellites and electronic extensions. As such, it can be programed as an art form, just as content is programed for other media.[20] Van Der Beek agrees with McLuhan that there may be a beautiful world dawning:

> We are on the verge of a new world—a new sense of art, life and technology—when artists shall deal with the world as a work of art, and art and life shall again become the same process. When man's senses shall expand, reach out, and in so doing shall touch all men in the world.
>
> In my view I see that art and life, man and technology, unite and seek to renew and re-view. . . .
>
> In particular I see that motion pictures will become "emotion-pictures" and will generate into a new structure, a new context, becoming a nonverbal international picture language, in which we can talk to each other. . . .[21]

White believes that science and technology are contributing to the building of a democratic culture by eliminating false distinctions between social classes. He believes ". . . we are on the way toward building a new sort of humanism that encompasses in its sympathies all kinds of creativity, including those involving hands as well as brains."[22] Fuller predicts the future use of two-way television as a means of revitalizing democracy. Because our society is now so mobile, our representatives no longer represent us: we know little about them and they even less about us. At present, says Fuller, we are being confronted with issue after issue with no adequate means of expressing

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[19] Fuller, "Vision 65 Summary Lecture," *The American Scholar, op. cit.*, p. 218.
[20] McLuhan, "Address at Vision 65," *The American Scholar, op. cit.*, p. 199.
[21] Van Der Beek, "Re: Vision," *The American Scholar, op. cit.*, p. 339.
[22] White, "On Intellectual Gloom," *The American Scholar, op. cit.*, p. 226.

immediately our position or feeling. With two-way television, ***vox populi*** could once again be heard through constituents beaming back "yes," or "no," "I like it," or "I don't like it."[23]

> . . . With two-way TV, constant referendum of democracy will be manifest, and democracy will become the most practical form of industrial and space-age government by all people, for all people.[24]

In a world in which no man need starve, be a slave, or physically toil to the detriment of his health, in which every man can be creative and instantaneously communicative with others, liberal education will be a life pursuit. For it to become this, Michael Harrington, author of *The Other American*, maintains that we need to change radically our notions about what work is, and that we must consciously plan for what we now regard as leisure.[25] W. H. Ferry, vice president of the Fund for the Republic, agrees:

> . . . We have had a wrong idea of education for a very long while in this country as being a chore that one must undergo for a certain number of years in his early life because it's the only way he can be sure of a job at the end. The cartoons—and this seems very revealing to me—are always of kids grousing about going back to school and how disagreeable it all is. There is a myth about education as a necessary evil in our lives. This has to be changed. Nobody who has gone through it would disagree that any education that's worth the name is terribly hard work. What the Peace Corps youngsters go through is terribly hard work. But it has raised them as human beings into new dimensions. The definition of education as work, a kind of effort recognized as of the greatest value to the state and to the human beings involved, should enter into our new concepts of work.[26]

Fuller maintains that as an economic society, we are going to have to pay our entire population to go to school and to stay in school, that is, to stay in the education process. Our national

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[23] Fuller, *Education Automation* (Carbondale, Illinois: Southern Illinois University Press, 1964), pp. 40-42.
[24] *Ibid.*, p. 42.
[25] *Cacotopias and Utopias: A Conversation* (Center for the Study of Democratic Institutions, 1965), p. 9.
[26] *Ibid.*, p. 27.

investment shall be education because education will be our most important commodity.[27] Formal or institutional education will have faint relationship to that which now takes place in schools. Digital computers, for example, may ameliorate university education by eliminating much that seemingly has little to do with genuine learning:

> . . . The pedagogical responsibility of the university is not to lecture or assign problems or grade them. It is to create a situation within which most bright students will automatically learn. The multi-user digital computer opens new horizons for anyone eager to create such situations.[28]

Ericksen finds it exciting ". . . to consider the potential impact of a computer-based information processing network that can link the student, working in any given terminal, with other libraries and institutions throughout the state, nation, and perhaps the world."[29] Fuller predicts that

> . . . The universities are going to be wonderful places. Scholars will stay there for a long time—the rest of their lives—while they are developing more and more knowledge about the whole experience of man. All men will be going around the world in due process as everyday routine search and exploration, and the world experiencing patterning will be everywhere—all students from everywhere all over the world. That is all part of the new pattern that is rushing upon us. We will accelerate as rapidly into "yesterday" through archaeology as we do into "tomorrow." Archaeology both on land and under the seas will flourish equally with astronautics.[30]

Freed by programed materials from routine instruction, the teacher will be able to present himself to his students as a model, as an embodiment of ". . . what the intellectual resources of our culture *can* mean in the lives of adults in this society."[31]

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[27] Fuller, *Education Automation*, *op. cit.*, p. 46.

[28] Alan Perlis, "The Computer in the University," in *Computers and the World of the Future*, ed. Martin Greenberger (Cambridge: Massachusetts Institute of Technology Press, 1962), p. 208.

[29] *EDUCOM*, February, 1966, p. 3.

[30] Fuller, *Education Automation*, *op. cit.*, p. 49.

[31] James McClellan, "Automated Education," in *Programs, Teachers, and Machines*, *op. cit.*, p. 114.

Whether we can create a global Utopia in which education shall be work and the proper study of mankind, man, depends on our ability to control atavistic fears—fear that unless we slay the "enemy," he may eventually supplant us by proving himself more fit; fear that unless we grab first, we may be left wanting. There is no question about our ability to annihilate each other; Fuller informed conferees at Vision 65 that ". . . for every human being on the face of the earth today, we have now twenty-eight thousand pounds of explosives (T.N.T. equivalent)—that's fourteen tons per capita, which is to say that for every pound of human flesh there are two hundred pounds of self-annihilating explosives."[32] There is question about our ability to put away ancient prejudices and to channel the electronic revolution for humane and humanistic ends. If we can control our passions so as to control our machines, we may yet learn to love ourselves and our neighbors as ourselves in the world tribal village we are creating.

> . . . Perhaps we've not lost our vision of Utopia. Perhaps it's changing. As man changes. Perhaps what we're all a party to is a struggle between man and mankind: the point of evolutionary decision between Homo sapiens and (dare I coin the word) Homo cybernetics.[33]

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[32] McClellan, *op. cit.*, p. 114.
[33] Aubrey Singer, "Television," *American Scholar, op. cit.*, p. 306.

V. Implications for the Teaching of English

. . . We have actually entered a new era of evolutionary history, one in which rapid change is a dominant consequence. It will do no good to resent this, as many humanists do, or even to blindly fear the future as some others may. Our only hope is to understand the forces at work and to take advantage of the knowledge we find to guide the evolutionary process. Scientists and engineers, just as every other resident of this planet, are captives of the process that has been generated by the scientific revolution.[1]

Probably a great many things are stirring; but it is certain that many of them can be summed up by saying that we are leaving the Gutenberg era behind us. As we move further into a technological civilization, we meet with abundant signs that the relationship between the teacher and a large area of communication, which includes practically all of what we generally mean by "literature," are no longer what they used to be. These relationships were set up in the Renaissance when a typographical civilization appeared, climaxing the intense development of a manuscript culture which had marked the preceding Middle Ages. The present swing is to oral forms in communication, with radio, television (oral in its commitments as compared to typography), public address and inter-com systems, or voice recording (to replace or supplement shorthand, longhand, typing, or print). As a result of this swing, older relationships are undergoing a profound, if not often perceptible, realignment.[2]

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[1] Jerome B. Wiesner, "Society as a Learning Machine," *New York Times* (advertisement), April 24, 1966, Sec. 11, p. 15.

[2] Walter J. Ong, "Wired for Sound: Teaching, Communications, and Technological Culture," *College English*, XXI (February 1960), 246.

Television

The day no longer exists when the teacher of English can declare proudly at a faculty soiree, "We don't have TV in our home." Anyone who now ignores a medium found in over fifty million households within the nation and regularly viewed by over 90 percent of its population can not be overly concerned with the culture in which he lives or the people with whom he must communicate. One could go so far as to say that the elementary or secondary teacher who ignores television abjures a professional if not ethical responsibility to help students develop sound taste for all artistic media. Paul Witty's studies reveal that for the past decade elementary school students have viewed television on the average of 20-21 hours weekly, while high school students have spent an average of 12-14 hours before the TV screen. Those who refuse to help students develop taste, dismissing television as ersatz entertainment, blind themselves to the medium's artistic potential. Among television's notable accomplishments have been the artful presentations of such programs as *Macbeth*, *The Tempest*, *Hamlet*, *Don Juan in Hell*, *The Iceman Cometh*, *A Doll's House*, *Ethan Frome*, *Our Town*, *Death of a Salesman*, *The Moon and Sixpense*, *Treasure Island*, *The Power and the Glory*, and *Arrowsmith*. And the majority of those mentioned were produced by commercial, not educational, television.

Considerable evidence suggests that when the society is sufficiently alerted to the aesthetic values of a future production, it can respond amazingly. Neil Postman reports in *Television and the Teaching of English* that

> . . . on March 11, 1956, NBC presented a three-hour broadcast of Sir Laurence Olivier's film version of *Richard III*, which was seen by one of the largest daytime audiences in television's history. Trendex surveys indicated that at least twenty-five million people saw the play. If these figures are to be trusted, they mean more people saw *Richard III* on one single afternoon than the probable combined total of audiences for stage productions of all Shake-

speare's plays since he wrote them.[3]

If artistic programs do not always have audiences the size of those won weekly by *Bonanza*, responsibility might lay largely with teachers who seldom if ever announce the potential merits of a forthcoming production, let alone spend time in class discussing the program after it has been presented.

To dismiss television's claim on the classroom because of the number of shoddy programs run through its channels is akin to dismissing all products of printing because of the number of potboilers published. One is tempted to speculate that if teachers of English spent as much time trying to improve viewing habits as they do trying to improve reading habits, results might be far more dramatic and, for some students, educationally more profitable.

To argue on more pragmatic grounds, one could point out that television is a commercial enterprise, just as is publishing. As the median age of the citizenry drops with the increase of population (approximately 50 percent of Americans are now under age 25), taste will be increasingly dictated by the young. Unless that taste is developed through education, the teacher of English who now not only reads but views selectively—but who never teaches his students criteria by which they might do the same—may find fewer and fewer programs (and books) to his liking. To damn Madison Avenue for its Philistinism in promoting the second and third rate is to forget that the promotion is endorsed by Philistines who watch the programs; Madison Avenue alone should not be faulted. Further, to ascribe to the publishing industry a commercial purity not shared by the television industry is to reveal one's naivete about how contemporary authors are managed by forces outside their control. As Erik Barnouw, professor of dramatic arts at Columbia University, reminds us in an article in *Saturday Review*,

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[3] Neil Postman, in collaboration with the Committee on the Study of Television of the National Council of Teachers of English, *Television and the Teaching of English* (New York: Appleton-Century-Crofts, Inc., 1961), pp. 36-37.

> Our founding fathers tried to strengthen the individual by providing in the Constitution that only authors should be the beneficiaries of copyright law, but the 1909 copyright law (with dubious constitutionality) reversed this by changing the meaning of the word "author." Ours is thus the age of the corporate author. Individual author and artist are, in any case, separated from their audiences by an obstacle course of agents, editors, producers, financiers, distributors, jobbers, and retailers, all of whom are potential barriers to communication—censors with veto power.[4]

A teacher of English who accepts responsibility for helping students develop taste appropriate to the age in which they will live should spend considerable time in the classroom discussing television programs. For the present, he may be able only to preview future programs and encourage rather than assign students to view them. Through weekly dittoed announcements of forthcoming programs, bulletin board displays, and oral announcements, he can alert students to educationally worthwhile programs. By structuring group and panel discussions about programs watched during the week, he can help students learn to evaluate judiciously their viewing experiences.

Though the teacher cannot now be assured of the commonality of his students' TV habits, the time is rapidly approaching when he will find video tapes as readily available for his classes as phonograph records are today. Under the teacher's direction students can then share outstanding programs with the same critical attentiveness now accorded selections in their anthologies.

This is not to argue that teachers of English should purge their classrooms of books. Though electronic devices may eventually eliminate most books as physical objects, that day is not yet with us. And, as John Tebbel, of New York University, explains, information of the kind to be placed directly onto microfilm or other storage mechanisms in a memory bank differs from literature, the heart of most English programs:

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[4] Erik Barnouw, "McLuhanism Reconsidered," *Saturday Review*, July 23, 1966, p. 20.

> . . . all publishing is not information. . . . A novel is not information, nor is a collection of short stories or poems, nor for that matter is a biography or a book of social commentary or history, in the sense that the technologists think of information. . . . The publisher of the future will certainly be in the information business . . . and the information, or at least a substantial part of it, may well be conveyed to the consumer by means other than books. But there will also be an audience for books—for those books that are not "information" and which a man wants to hold in his hand and read, letting his brain form associations and ideas as he turns the pages.[5]

Walter Ong, S.J., of Saint Louis University, a Renaissance scholar as well as one concerned with the effects upon the teaching of English of our technological culture, believes that printing, because of its great pedagogical value, will continue in the classroom in some form or other.

> . . . it is unlikely that printing (or its recent manifold variants such as mimeographing or planographing) will ever be done away with in teaching or elsewhere generally. It is incontestably convenient to have the spoken word frozen in space, and frozen in exactly the same space for everyone among one's auditors. The teacher is not likely to forego the luxury of being able to say, "Everyone turn to page 83, line 4 from the top, and look at the third word from the left." This luxury is too hard-won. For such a directive was entirely impossible before the invention of printing, when, if the students had manuscript books, every book would have every word in a different place from every other book.[6]

Rather than arguing that books be replaced with electronic media, this paper advocates that newer media be given a legitimate share of classroom time, legitimate to be defined in relationship to the course one is teaching and to the nature of his students. In no class in English should television, for example, be totally ignored, nor should it necessarily be given status inferior to that of print. As a consequence of electronic media—telephone, tape recorder, motion picture, phonograph, and television—we live in an oral-aural environment, one in which most communication takes place via the human voice

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[5] John Tebbel, "Book-Publishers' Salvation?" *Saturday Review*, July 23, 1966, p. 33.

[6] Ong, *op. cit.*, p. 247.

and one in which contemporary prose style increasingly reflects the diction and syntax of spoken English. As Father Ong observes,

> Voice is coming into its own as never before. But the ways in which it is doing so, and the elements in our culture which favor voices as well as those which militate against it, are complex in the extreme. We can arm ourselves and our students only by vigilant awareness of what is going on about us. In particular, teachers and students of language and literature must cultivate sensitivity to the more profound significance of the media of popular culture—which is not the same thing as either uncritical acceptance of popular culture or entrenched hostility to all its manifestations.[7]

Beyond making more dominant an environment already substantially oral-aural, television has affected our perceptions and concerns in various ways. By juxtaposing advertising and content, as do newspapers, radio, and magazines, and by employing such cinematic techniques as the double exposure, television stories avoid the orderly linear sequence of beginning-middle-end found in most prose fiction. A story begins, is interrupted, resumes, is interrupted, etc. Although related to historically established forms of the novel, such recent bestsellers as Heller's *Catch 22*, Barth's *The Floating Opera*, and Bellow's *Herzog* may owe some of their popularity to their structural affinity to the sputtering, digressive, unlinear TV plot.

Besides interrupting the linear development of a story, television in its news presentations inverts normal story order by presenting the climax first, a technique learned from the newspaper and adopted also by radio news programs. Students who find dull the Victorian novel live in an environment that seldom presents to them details that move leisurely toward a climax. Consequently, many students become easily bored with novelists like Dickens or Austen and want to shift to an activity that "turns them on," a metaphor appropriately electronic, though perhaps inappropriately hedonistic.

Also having implications for the teaching of English is the

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[7] *Ibid.*, p. 250.

present homage being paid television as the most important source of news. Elmo Roper's studies reveal that a higher percentage of people receive their news from television than from radio or newspapers, that television is considered the most believable news source, and that television is a more desired medium than radio, newspapers, or magazines. Teachers of English have long recognized and often taught that newspapers, through linguistic duplicity, can distort reality; perhaps equal concern should now be given the semantic distortions of television—the ways in which the camera can lie or the edited film can distort a picture of reality.

Finally, by bringing home the concerns of our time, television has produced a generation of "activists," sufficiently discontent with aspects of our culture to be willing to march, sit down, sit in, or fight to effect social change. One can debate McLuhan's assertions that TV is a "cool" rather than "hot" medium, tactile rather than visual, more able to involve the individual totally than is a book. But one finds it difficult to deny that reading about Vietnam daily and viewing battle scenes nightly are not the same, that the latter experience has greater immediacy and emotional shock than has the former. Likewise, it is one thing to read about the plight of the Negro in our culture and quite another to see that plight enacted over and over again on a television screen in one's living room. In fact, Erik Barnouw suggests that television might be credited for giving impetus to the Negro revolt:

> . . . Before television the radio industry was close to lily-white but not, of course, in visible terms. Its replacement by blatantly white television coincided with the gathering momentum of the Negro revolt. Was there a connection? Did mid-century television, virtually denying the existence of the Negro, serve as goad?[8]

Just beginning to be understood are the services television can perform in the pre- and inservice education of teachers. Through use of video tape with instant playback, interns and student teachers are able to analyze their performance before

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[8] Barnouw, *op. cit.*, p. 20.

a class and recommend changes in their own procedures or mannerisms. With closed circuit television, novice and experienced teachers are able both to watch master teachers conduct a class and to participate in professional conferences geographically removed from the school site.

Though there has been considerable experimentation in the uses of closed circuit television for classroom instruction, little has been done yet with TV to extend vicariously the experience of youngsters in inner-city schools or to supplement the skills of the regular teacher: occasionally a person having a particular expertise the regular teacher lacks could appear on closed circuit as the "guest" instructor for the day. Nor has closed circuit television been used as extensively as it might be for intra- or interscholastic academic competition among students.

Highly problematic is Fuller's prediction that the time is coming when students will receive almost all their elementary and secondary education at home. What seems certain is that television in the next few decades will become more important and perhaps academically more prestigious than it is today. As satellite networks develop, which unquestionably they shall despite the prodigious political and economic problems that must be overcome, man will no longer need to travel physically to change his environment; his stimuli will change by the world's coming to him. Or, if he prefers, by the world's traveling with him, as mobile as a paperback in the pocket of his coat. What implications for the teaching of English this shall have no one can augur:

> Motorola, Inc., has developed a tiny television set which operates on penlight batteries, produces a fine, clear picture about the size of a 50-cent piece and fits into a man's shirt-pocket.
>
> The set works efficiently inside or outside of buildings, picking up its signal on antennae built into earphones which carry its sound.
>
> Its picture is detailed, accurate, and easy to watch once a viewer adjusts his eye to the miniature size.
>
> Motorola officials said one of their engineers, De Loss Tanner, developed the little receiver two years ago . . .
>
> Tanner said the company has no plans to market his tiny receiver, which is considered strictly experimental.

> Some industry officials said that, on the analogy of the transistor radio and its booming sales, any company which put out vest-pocket television receivers might expect to sell millions, if the price were low enough.[9]

The Motion Picture

> There are many reasons why we have considered the role of the moving picture in the teaching of English. First, the film has an unparalleled power to transmit information and inferences. Second, it may illuminate and augment the study of literature. Third, it has form, structure, theme, irony, metaphor, and symbol—aspects of any work of art, and hence subject to examination and isolation. And finally, it is concerned with ethics, values, and truth—which may be embodied or distorted in films as in any other medium.[10]

The publication of Edward Steichen's carefully selected and organized collection of photographs showing people around the world living out the cycle of their days—working, playing, loving, worrying—needed no captions or footnotes. *The Family of Man* demonstrated once again photography's power to communicate globally.

Earlier in this paper, Stan Van Der Beek was quoted as having asserted that motion pictures are the unique art form of the twentieth century and that motion pictures ("emotion pictures") will become a nonverbal international picture language through which we can talk to each other. Though the sound motion picture is not yet a *nonverbal* international language, its verbal content is clearly transcended by its pictorial communication. Within the past decade millions in this country have viewed and understood with a minimum of translated dialogue films from diverse national origins, countries in which the majority of these same viewers could not have linguistically communicated. Some that have been favorably re-

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[9] "TV Set That Fits in Your Pocket," *San Francisco Chronicle*, May 31, 1966, p. 47.

[10] Marion Sheridan, *et al.*, *The Motion Picture and the Teaching of English* (New York: Appleton-Century-Crofts, Inc., 1965), p. viii.

ceived are *Wild Strawberries* (Sweden), *Ballad of a Soldier* (Russia), *The Apu Trilogy* (India), *Woman in the Dunes* (Japan), *The Shop on Main Street* (Czechoslovakia), *La Dolce Vita* (Italy), *Jules and Jim* (France). The reader can easily think of others.

Though the authors of *The Motion Picture and the Teaching of English* correctly maintain that the motion picture, as a visual art form in its own right, can not be expected to replicate the art of written literature, one should not overlook its power to supplement literature, or at times supplant it for those unwilling or unable to read the literary selection upon which a film is based. One could compose a sizeable list of films which draw upon works taught in the schools. Among modern plays made into memorable motion pictures have been *The Diary of Anne Frank, The Miracle Worker, Pygmalion, The Crucible, Abe Lincoln in Illinois,* and *The Glass Menagerie.* Films based upon novels frequently taught include *The Red Badge of Courage, To Kill a Mockingbird, David Copperfield, The Good Earth, The Grapes of Wrath, Lord of the Flies, The Bridge of San Luis Rey, Great Expectations,* and *The Ox-Bow Incident.* The film library of Shakespearean drama is considerable: *Julius Caesar, Macbeth, Romeo and Juliet, Hamlet, A Midsummer Night's Dream, Othello, Henry V, Taming of the Shrew,* and *Richard III.*

Because of its visual and auditory clues, the film has a unique ability to communicate to students with varying intellectual capacities, an ability that teachers of English have not always capitalized upon. Films such as *Julius Caesar* or *Great Expectations,* for example, can be viewed and discussed in almost any sophomore class, though not all sophomores are capable of reading either the play or the novel. Further, the film can serve as a substitute artistic experience in classes in which students do not have access to the literature. A school not possessing copies of *Romeo and Juliet* for students may nevertheless sponsor student attendance at the film. Finally, the film can be a fillip for reading the literary selection, a use ignored by teachers who see the motion picture only as frosting to follow, provided there is time, the already-devoured cake.

Children's librarians can attest to the run on *The Wizard of Oz* following Judy Garland's annual TV exposure to the masses and to the demand for *Mary Poppins* following the production starring Julie Andrews. According to the authors of *The Motion Picture and the Teaching of English*, Jerry Wald reported that the cinematic production of *Lost Horizon* spurred the sale of 1,400,000 copies of the novel.[11]

Though motion pictures have considerable educational promise, one should not hastily condemn teachers who have not frequently used them in the classroom; for audiovisual equipment in many schools is antiquated and the coordination of facilities, poor. Most experienced teachers of English can recount at least one story about a day on which a projector broke down, a film split during showing, or, worse yet, a motion picture scheduled a year ahead of its classroom use either did not appear or else appeared at an inopportune time, only to be whisked away before it could be effectively used. Moreover, until recently a full-length film could seldom be viewed in one classroom period, its aesthetic integrity truncated by the fifty-minute hour.

Hopefully, such problems as these will be mitigated if not eliminated in the future. Newer equipment, including self-threading projectors, is becoming available and less expensive. Innovative curricular patterns such as flexible scheduling and team teaching are making possible at a single sitting the viewing of a full-length motion picture. Finally, access to excellent films is being made easier by the decentralization of national distribution agencies and audiovisual centers in large school districts.

Among visionaries in the electronic industry, there appears little dispute regarding the continued importance of motion pictures, David Sarnoff even predicting that tomorrow's homes will have libraries of great films, comparable to today's collection of recordings. In fact, Sarnoff foresees " 'a true communications revolution' with the telephone, record and tape player, radio, TV, and film projector merged into one unit that

[11] Sheridan, *op. cit.*, p. 49.

will also publish magazines and newspapers in your home."[12] Until that day arrives, and perhaps even more importantly thereafter, the teacher of English will have an obligation to use and to teach the motion picture in a multiplicity of ways in his classroom.

Radio

> Radio still attracts children, despite the stronger appeal of TV. In 1965, the pupils in grade 2 stated that they spent about four hours each week listening to radio while in grade 5, as in grade 6, the weekly average was about eight hours. The weekly averages for grades 2-6 was 7 hours. Programs featuring music were given first place; baseball was second for the boys, news for the girls. In the high school survey, students said that they spent about 12-14 hours each week listening to the radio.[13]

A familiar figure in society is the person who physically attends one event while psychically attending another. He can be found at football games listening to baseball games, and at concerts listening to news. And, eyes aglow, he can be found wandering down school hallways, his transistorized ear tuned—and attuned—to rock and roll, his mind transported to a beyond in which books don't exist and teachers don't dwell.

If the student's world is one in which the latest recording of the Beatles or the Rolling Stones seems of greater import than the latest novel by Cheever or Updike, a world of the hard sell, in which every record to which he listens is punctuated with two or three blatant appeals to his pocketbook, then perhaps the teacher of English ought to move the transistor radio out of the hallway and into the classroom, at least temporarily.

More than one ad man has proclaimed that advertising is the poetry of the age, a statement bearing a bitter truth. From poetry, advertising has borrowed the affective uses of language,

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[12] Aline Mosby, "TV of the Future—It'll Be Something to See," *San Francisco Chronicle-Examiner*, June 19, 1966, Sec. 11, p. 5.

[13] Paul Witty, "Studies of the Mass Media, 1949-1965," reprinted from *Science Education*, March 1966.

the emotional rather than the cognitive appeal, connotation in preference to denotation. If students are not to remain at the mercy of the unscrupulous word, spoken as well as written, then teachers of English must help them develop the critical powers which will prevent their being constantly deceived by modern medicine men. By teaching students how to listen critically to the appeals of advertising, the teacher can simultaneously help them discriminate between the poet's desire to share experience and the advertiser's more pragmatic aim, to peddle others' wares. Too, rock and roll lyrics might be examined and evaluatively compared to the lyrics of folk and literary ballads. Teachers have devised less promising introductions to poetry.

Lest radio be unfairly relegated to being the medium of the raucous blare, one should remember that since the advent of FM, there has been available to the selective listener an increasing number of stations featuring programs of artistic excellence and contemporary value, programs of classical music, of traditional and modern drama, of poetry, and of current issues probed in depth. If teachers of English have slighted television, they appear to have disdained radio, an egregious fault in that an AM/FM radio is inexpensive and mobile, a piece of equipment which can contribute substantially toward ameliorating the academic tone of the classroom and elevating students' tastes. If for some reason the teacher chooses not to play a radio in his classroom, he might at the very least, as was recommended for television, alert students to forthcoming programs of literary or other educational value, programs to which they might listen outside school hours. To do less is to fail to help students fulfill the cultural promise of their times.

Recordings and Tapes

Of all electronic media easily available to the classroom, teachers of English have consistently made most use of the record player and the tape recorder, though most use and best use are not synonymous.

As is true of their attitude toward the motion picture, teachers of English still too often regard tapes and recordings as media peripheral or ancillary to print, something to follow the reading of the literary selection provided there is time. That for some classes recordings or tapes might be substituted for written materials appears unthinkable; yet research reveals that for many students auditory comprehension is higher than visual comprehension, principally because oral reading provides that which can only be inferred from print—pitch, stress, pause, or, if one prefers, the suprasegmental phonemes. Too, it seems most strange that some teachers would rather have students struggle constantly to read literary pap than have them listen frequently to that which has substantive literary value.

For many students, the matter is not an *either—or*. Because their parents never read aloud to them, they cannot hear the melodies of prose as they read or write. Linguists carefully distinguish the differences between the spoken language and the written language, the latter having a more ordered and predictable syntax, a more formal diction, a greater number of stylistic conventions. Since the written language is deprived, as speech is not, of sound, gesticulation, and immediacy of audience, the youngster who has not *heard* prose read aloud over a considerable time is linguistically handicapped. For this reason, many teachers working with the culturally disadvantaged in secondary schools are employing the equivalent of the listening posts found in elementary classrooms. For instance, after school a teacher may read an anthologized story into a tape recorder to which are attached eight sets of earphones. The next day selected students listen to the story as they follow along in their textbooks, during which time the teacher is freed to work with other individuals or groups.

Another use for the tape recorder is that of helping students improve their usage and diction, a use for the culturally disadvantaged that goes well beyond recording an occasional speech they might deliver. Dual-tract tapes, similar to those used in the Army language schools, are employed. The upper track of the tape presents the language patterns the students are to

emulate on the lower track. San-su C. Lin points out that some students will need concerted training to hear the sound system of Standard English.

> . . . If the grammatical concepts of noun plural and verb tense do not exist in a student's dialect, it is not likely that he is aware of the sound segments that signify these concepts. According to our experience, a student simply did not see the *s* and *ed* endings printed in black and white when he was asked to read aloud a paragraph in the textbook, and, after several months of practice with the tape recorder, we often found him conscientiously repeating "Johnny begin to read" when the model voice clearly said "Johnny begins to read." To plead with him to listen carefully was useless. . . . Probably the entire cultural background of these students was not conducive to good listening. A student, therefore, must be trained intensely to hear the significant sound segments in a word, particularly those representing important grammatical concepts in Standard English, so that these concepts might penetrate his consciousness and, in turn, sharpen his perception.[14]

The rich store of available recordings and tapes (see, for example, *An Annotated List of Recordings in the Language Arts*, compiled and edited by Morris Schreiber, NCTE, 1964) offers able students opportunities not only to listen to professional readers and authors reading the same works but to compare professional interpretations of classics such as *Hamlet* or *The Rime of the Ancient Mariner*. With both public and school librarians adding regularly to their stock of recorded literature and with the increasing use of listening carrels in libraries, one is assured that emphasis upon the literary uses of the spoken word will continue to flourish.

One further use for the tape recorder that has ethical as well as pedagogical implications is that of a teacher's taping a classroom hour in order to analyze and improve upon his skill as a discussion leader. Because the technique borders upon invasion of pupils' privacy, it probably should never be used without students' knowledge and permission.

The classroom library is as important to the teacher of

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[14] San-su C. Lin, "Pattern Practice in a Freshman English Program," in *Social Dialects and Language Learning*, ed. Roger Shuy (Champaign, Ill.: National Council of Teachers of English, 1965), p. 58.

English as it always was. But, alone, it will no longer serve; even a modestly equipped classroom should now contain a television set, an AM/FM radio, at least one tape recorder, a record player, and blackout curtains—these in addition, of course, to the equipment housed in the departmental office: the ditto and xerox machines, the film, overhead, and opaque projectors. Without instructional electronic media close at hand, the teacher of English presents himself to students as a figure outside the midtwentieth century and outside the significant intellectual and emotional orbits of their lives.

The Computer

> Will there be a tendency in the future to create an environment where we treat each other as machines; i.e., where there is no opportunity to "change the system's mind"? How can we create a society where we treat our citizens as people and not as machines? How can we create a society where each individual has the opportunity to explore and unfold his own special potentials—to realize what he is?
>
> These questions lead to further questions—to questions about who we are and what it means to be a *person*. And this brings us to the problem of *values*. What kind of life do we want? What kind would we value—ought to have? How can we create a society that fosters those actions and goals that we value? How define and explicate values? How measure and compare and rate values? How select among competing values? How can we estimate the impact of computers on our values? [15]

The contribution of the computer to scholarship in English is already considerable and will continue to grow. The computer has prepared concordances and bibliographies, ruled on the authenticity of authorship of disputed passages and works, housed literary and linguistic documents too unwieldy to be stored in other ways.

ERIC—Educational Research Information Center, a unit in the Division of Research Training and Dissemination, Bureau

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[15] John Lear, "Whither Personal Privacy?" *Saturday Review*, July 23, 1966, p. 41.

of Research, U.S. Office of Education—is cosponsoring among its other educational clearinghouses two computers to store materials pertinent to pedagogy and scholarship in English, one to be located at Champaign under the auspices of NCTE, the other to be in New York under the aegis of MLA. Documents considered nationally significant (approximately 2,000 of every 5,000 examined) will be summarized in 250 words and stored in the Office of Education. The summaries will be widely disseminated, and interested educators will be able within a week to obtain at nominal cost the full document, either on microfilm or hardcopy, through the ERIC Document Reproduction Service. More esoteric documents in English scholarship or pedagogy will be distributed directly from the centers at New York and Champaign.

Once fully developed, the nationwide network of information clearinghouses or research documentation centers that ERIC represents can have tremendous impact on scholarship and teaching in English: results of research can be extensively and quickly known and will be sped where and when needed.

Rather fully explored earlier in this paper is the potential use of the computer to catalogue and store materials within a single library and to coordinate nationally and even internationally facilities among libraries. Through the work of agencies like EDUCOM, the resources of the Harvard Library may eventually be at the disposal not only of a junior college student in Phoenix, Arizona, but of a high school student in Anchorage, Alaska. Implications for scholarship and teaching in English are profound: no longer will the researcher have to spend his sabbatical trekking from library to library in search of otherwise unobtainable documents; no longer will elementary and secondary schools have fewer literary materials available than can now be found at many corner drug stores.

To date, the computer has been employed in a number of ways that affect the classroom teaching of English. Besides being able to read a composition, it can give a spelling lesson or provide instruction in beginning reading. It may soon be able to give systematic instruction in grammar, teach students rhetorical strategies for composing, inductively present

distinguishing characteristics of a given literary form.

Though the computer can speak to students (there is even a digital analogue computer complex that speaks without a prerecorded voice), it is doubtful that it can ever completely replace a teacher in the classroom. Psychologists continue to reassure us that there is a human need for human beings. Also, as James Ridgeway reveals in an article in *The New Republic*, the cost of computerized instruction is at present exorbitantly high to develop and use:

> . . . widespread use of computers as teachers is a long way off. The machines still are clumsy and very expensive. IBM's 1500 series costs from $6,000 to $12,000 a month to rent for a computer that can handle 32 children. There are few inspired programs that are published in books, let alone interesting ones for computers. It can cost as much as $10,000 per hour of instruction to write, test and revise a good program, and it may well take three or four years to do the job properly.
>
> Big companies which are diversified enough to stay in the race 15 or 20 years are the ones most likely to succeed in education. . . . Thus, the outlook for making a fast buck is not good. In their eagerness to stake out a claim in the education market, businessmen have invested close to half a billion dollars within the past year or so. Yet they are shooting at a market at best worth $1.5 billion a year —including textbooks. . . .[16]

Ridgeway goes on to say that the education industry will expand or contract depending on the amounts of money the government puts into the market. Because government encouraged a greater commitment by business to education, government support will continue, Ridgeway believes. In any case, large scale use of the computer in the classroom still seems years away.

As the computer becomes increasingly influential in almost every dimension of our lives—our health, wealth, education, and mobility, among them—serious dangers exist that we will become more dehumanized, particularly since the accelerating rate of our population expansion corresponds to the ever more

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[16] James Ridgeway, "Computer-Tutor," *The New Republic*, June 4, 1966, p. 21.

widespread use of the computer. The possibility of a mass man, insensitive to human tradition, human feeling, and human values, conniving, manipulative, and manipulated, haunts us.

But it need not become reality. The computer could free man to be creative, could place the locus of value on his individual experience and worth, could enrich rather than make sterile his days.

Consider what might be possible in education.

Freed by the computer from dull drill, the teacher of English could spend more time in tutorials and small group discussions, engaging students in a dialogue about human experiences and values as they are transmitted through literature. With the help of the computer, the college preparatory student, who now can find no room in his program for electives, could master skills more quickly and be freed to take drama, art, chorus, music appreciation—the humanistic subjects he is presently deprived of. By programing each secondary student, the computer could end our current "ability" grouping in English, so psychologically devastating to many youngsters, replacing it with an elective system of first, second, and third choices. The teacher would then find before him students who had chosen, not been legislated into, his course, a semester course in perhaps Shakespearean tragedy, or contemporary prose fiction, or modern poetry.

But the electronic revolution must have the guidance of humanists if it is to be that which it can be, the instrumentality for releasing the creative potential of each individual, rather than an ingenious means of further degrading human life. The revolution will continue; what direction it takes depends in good part upon the wisdom and participation brought to it by those of us who profess to teach English because we care about man.

> . . . A genuine purpose may be served by turning loose the wonders of the creative imagination on the kinds of problems being put to electronic tubes and transistors. The company of poets may enable the men who tend the machines to see a larger panorama of possibilities than technology alone may inspire. . . . The poet—and we use the term to include all those who have respect for and speak

to the human spirit—can help to supply the subconscious with material to enhance its sensitivity, thus safeguarding it. The poet, too, can help to keep man from making himself over in the image of his electronic marvels. For the danger is not so much that man may be controlled by the computer as that he may imitate it.

The poet reminds men of their uniqueness. It is not necessary to possess the ultimate definition of this uniqueness. Even to speculate on it is a gain.[17]

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[17] Norman Cousins, "The Computer and the Poet," *Saturday Review*, July 23, 1966, p. 42.

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